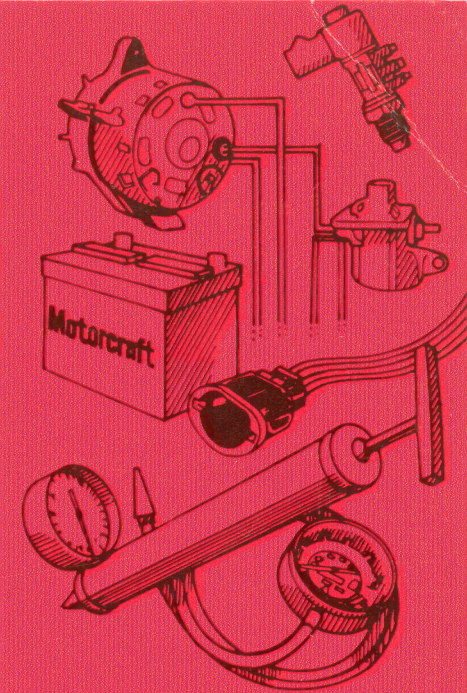
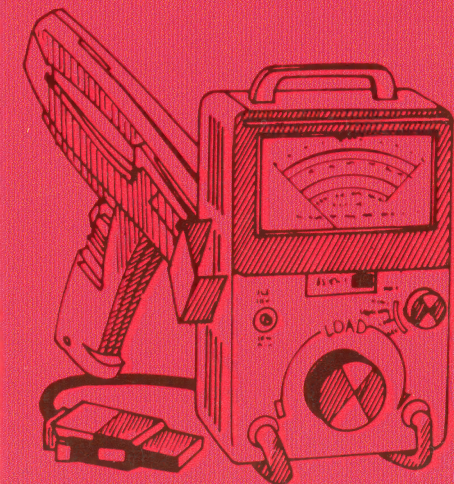


1989 MERKUR XR4Ti



Electrical & Vacuum Trouble- Shooting Manual



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IMPORTANT SAFETY NOTICE

Appropriate service methods and proper repair procedures are essential for the safe, reliable operation of all motor vehicles, as well as the personal safety of the individual doing the work. This Manual provides general directions for accomplishing service and repair work with tested, effective techniques. Following them will help assure reliability.

There are numerous variations in procedures, techniques, tools and parts for servicing vehicles, as well as in the skill of the individual doing the work. This Manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from the instructions provided in this Manual must first establish that he compromises neither his personal safety nor the vehicle integrity by his choice of methods, tools or parts.

The purpose of this manual is to show electrical and vacuum circuits of these vehicles in a clear and simple fashion to make troubleshooting easier. With each circuit is a description of *How the Circuit Works* and some *Troubleshooting Hints*. A *Component Location* chart lists components, connectors, and references to pictures in the manual.

Wiring Diagrams give a schematic picture of when and how the circuit is powered, what the current path is to circuit components, and how the circuit is grounded. Each circuit component is named (underlined titles). Wire and connector colors are listed (standard Ford color abbreviations are used):

COLOR ABBREVIATIONS

BL	Blue	N	Natural
BK	Black	O	Orange
BR	Brown	PK	Pink
DB	Dark Blue	P	Purple
DG	Dark Green	R	Red
GR	Green	T	Tan
GY	Gray	W	White
LB	Light Blue	Y	Yellow
LG	Light Green		

Where two colors are shown for a wire, the first color is the basic color of the wire. The second color is a stripe marking.

For Example:

BR/O is a brown wire with an orange stripe.

R/Y is a red wire with a yellow stripe.

BK/W is a black wire with a white stripe.

Connector end views of switches and other components are shown to help with bench testing. The views show the harness wire colors that connect to the mating terminals. Connector colors and locations are shown in the *Component Location* chart. Two-color listings indicate separate colors for each connector half.

Components which work together are shown together. For example, all electrical components used in any circuit are shown on one diagram. The circuit breaker or fuse is shown at the top of the page. All wires, connectors, splices, switches, and motors are shown in the flow of current to ground at the bottom of the page. Notes are included which describe how switches and other components work. If a component is used in several different circuits, it is shown in several places. For example, the main **Light Switch** is an electrical part of many circuits and is repeated on many pages. In some cases, however, a component may seem by its name to belong on a page where it has no electrical connection. For example, this occurs often in the case of instrument illumination, where a switch illumination bulb is located within the switch itself but has no connection to the circuit being switched.

Troubleshooting Hints point the technician in a general direction, but are not intended as a step-by-step procedure. Ignition troubleshooting is an exception to this. It includes a step-by-step procedure of basic quick checks to locate some of the more common **Ignition System** problems. Read the Shop Manual for more detailed repair procedures.

The **Grounds** pages show detailed views of multiple component ground points. This is useful for checking interconnections among the ground circuits of different diagrams.

Notes, Cautions, and Warnings appear in boxes on text pages and contain important vehicle and mechanic safety information.

Notes give added information to help complete a particular procedure. Cautions are included to prevent making an error that could damage the vehicle. Warnings highlight areas where carelessness

can cause personal injury. The following list contains some general **Warnings** that should be followed when working on a vehicle.

- Always wear safety glasses for eye protection.
- Use safety stands whenever a procedure requires being under a vehicle.
- Be sure that the **Ignition Switch** is always in the OFF position, unless otherwise required by the procedure.
- Set the parking brake when working on any vehicle. An automatic transmission should be in PARK. A manual transmission should be in NEUTRAL.
- Operate the engine only in a well-ventilated area to avoid the danger of carbon monoxide.
- Keep away from moving parts when the engine is running, especially the fan and belts.
- To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe, catalytic converter, and muffler.
- Do not allow flame or sparks near the battery. Gases are always present in and around the battery cell. An explosion could occur.
- Do not smoke.
- To avoid injury, always remove rings, watches, loose hanging jewelry, and loose clothing.

ABBREVIATIONS

Throughout the manual certain words are abbreviated to save space. The following is a list of the most commonly used abbreviations and a short explanation of their meaning.

T/O—Takeout, refers to a location in the harness where a wire or group of wires exits the main harness.

N.C.—No Connection, means that the terminal is not used or connector is not connected.

I/P—Instrument Panel

A/C—Air Conditioning

TROUBLESHOOTING STEPS

These six steps present an orderly method of troubleshooting:

Step 1. Verify the problem.

- Operate the complete system and see all symptoms for yourself in order to:
 - check the accuracy and completeness of the customer's complaint.
 - learn more that might give a clue to the nature and location of the problem.

Step 2. Narrow the problem.

- Using this manual, narrow down the possible causes and locations of the problem in order to more quickly find the exact cause.
- Read the description of *How the Circuit Works* and study the wiring diagram. You should then know enough about the circuit operation to figure out where to check for this trouble.

Step 3. Test the cause.

- Use electrical test procedures to find the specific cause of the symptoms.
- *Troubleshooting Hints* will give some helpful ideas.
- The *Component Location* charts and the pictures will help you find components, grounds, and connectors.

Step 4. Verify the cause.

- Confirm the fact that you have found the correct cause through operating the parts of the circuit you think are good.

Step 5. Make the repair.

- Repair or replace the faulty components.

Step 6. Verify the repair.

- Operate the system as in Step 1 and check that your repair has removed all symptoms, and also has not caused any new symptoms.

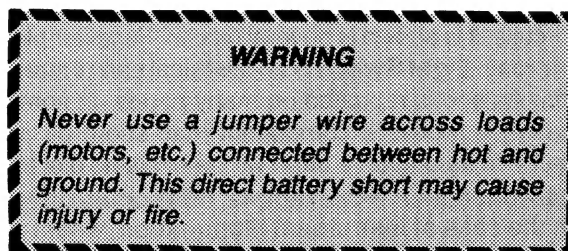
Some engine circuits may need special test equipment and special procedures. See the *Shop Manual* and other service books for details. You will find the circuits in this manual to be helpful with these special tests.

TROUBLESHOOTING TOOLS

JUMPER WIRE

This is a test lead used to connect two points of a circuit. A **Jumper Wire** can complete a circuit by bypassing an open.

Uses: Bypassing Switches or Open Circuits



VOLTMETER

A DC **Voltmeter** measures circuit voltage. Connect negative (– or black) lead to ground, and positive (+ or red) lead to voltage measuring point.

OHMMETER

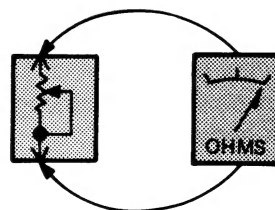


Figure 1 — Resistance Check

An **Ohmmeter** shows the resistance between two connected points (Figure 1).

TEST LAMP

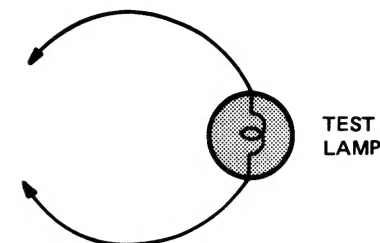


Figure 2 — Test Lamp

A **Test Lamp** is a 12-volt bulb with two test leads (Figure 2).

Uses: Voltage Check. Short Check

SELF-POWERED TEST LAMP

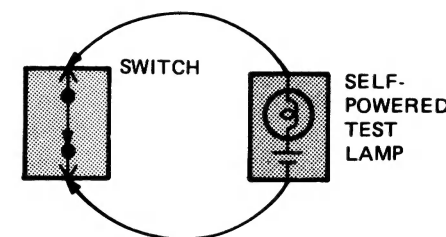
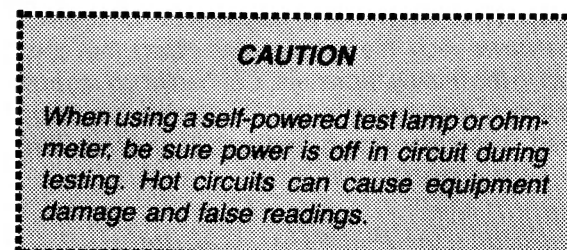


Figure 3 — Continuity Check

The **Self-Powered Test Lamp** is a bulb, battery and set of test leads wired in series (Figure 3). When connected to two points of a continuous circuit, the bulb glows.

Uses: Continuity Check. Ground Check



TROUBLESHOOTING CHECKS

SWITCH CIRCUIT CHECK

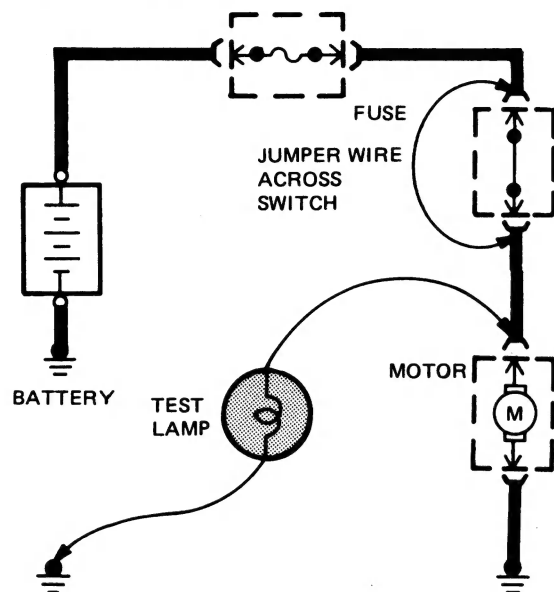


Figure 4 — Switch Circuit Check and Voltage Check

In a bad circuit with a switch in series with the load, jumper the terminals of the switch to power the load. If jumping the terminals powers the circuit, the switch is bad (Figure 4).

CONTINUITY CHECK (Locating open circuits)

With power off connect one lead of **Self-Powered Test Lamp** or **Ohmmeter** to each end of circuit (Figure 3). Light will glow if circuit is closed. Switches and fuses can be checked in the same way.

VOLTAGE CHECK

Connect one lead of **Test Lamp** to a known good ground, or the negative (–) battery terminal. Test for voltage by touching the other lead to the test point. Bulb goes on when the test point has voltage (Figure 4).

SHORT CHECK (Short to ground)

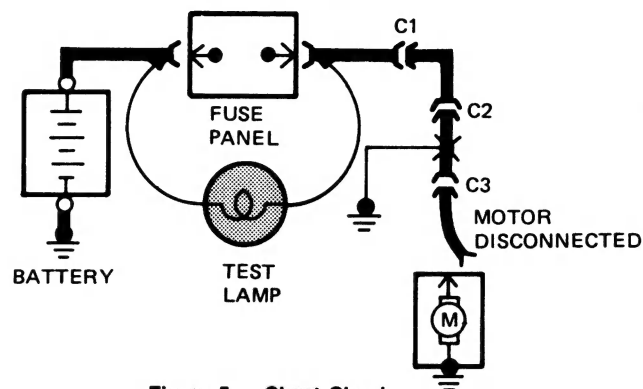


Figure 5 — Short Check

A fuse that repeatedly blows is usually caused by a short to ground. It's important to be able to locate such a short quickly (Figure 5).

1. Turn off everything powered through the fuse.
2. Disconnect other loads powered through the fuse:
 - Motors: disconnect motor connector.
 - Lights: remove bulbs.
3. Turn **Ignition Switch** to RUN (if necessary) to power fuse.
4. Connect one **Test Lamp** lead to hot end of blown fuse. Connect other lead to ground. Bulb should glow showing power to fuse. *(This step is just a check to be sure you have power to the circuit.)*
5. Disconnect the **Test Lamp** lead from ground and reconnect it to the load side of the fuse.
 - If the **Test Lamp** is off, the short is in the disconnected equipment.
 - If the **Test Lamp** goes on, the short is in the wiring. You must find the short by disconnecting the circuit connectors one at a time until the **Test Lamp** goes out. For example: with a ground at X, the bulb goes out when C1 or C2 is disconnected, but stays on after disconnecting C3. This means the ground is between C2 and C3.

"GOOD GROUND" CHECK

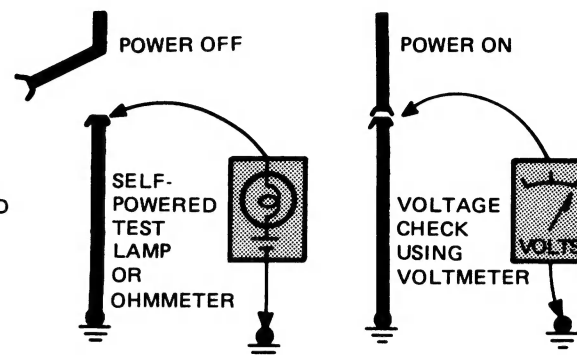


Figure 6 — Grounds Check

Turn on power to circuit. Perform Voltage Check between suspected bad ground and frame. Any voltage means ground is bad.

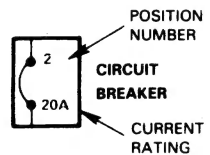
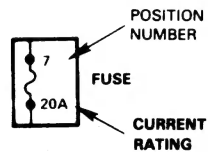
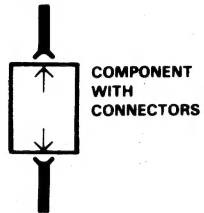
Turn off power to circuit. Connect one lead of **Self-Powered Test Lamp** or **Ohmmeter** to wire in question, and the other to known ground. If bulb glows, circuit ground is OK (Figure 6).

TROUBLESHOOTING HINTS

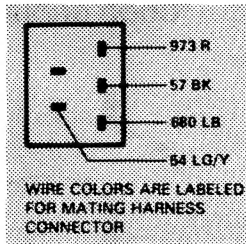
The circuit schematics in this manual are designed to make it easy to identify common points in circuits. This knowledge can help narrow the problem to a specific area. For example, if several circuits fail at the same time, check for a common power or ground connection. (See *Power Distribution* or *Grounds*). If part of a circuit fails, check the connections between the part that works and the part that doesn't work.

For example, if low beam headlamps work, but high beams and the indicator light don't work, then power and ground paths must be good. Since the dimmer switch is the component which switches this power to the high beam lights and indicator, it is most likely the cause of failure.

DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN, OR COMPONENT IS SHOWN IN TWO PLACES

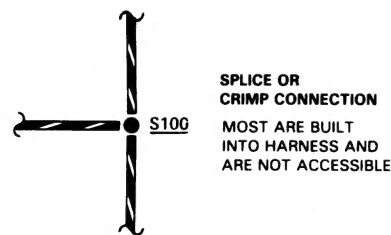
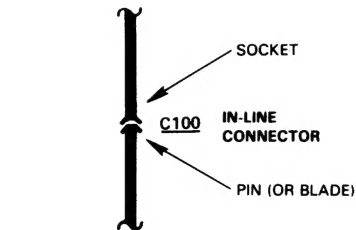


SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT



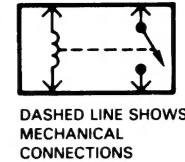
COMPONENT CONNECTOR END VIEW
SHOWS PINS OR SOCKETS ON A COMPONENT TO AID IN BENCH TESTING

PIN AND BLADE TERMINAL TYPES
● — PIN
○ □ SOCKET TYPES

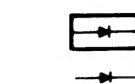


GROUND CONNECTION

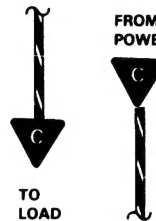
○ 20 GA BLUE ● FUSE LINK



RELAY
CONTACTS CLOSE WITH CURRENT THROUGH COIL



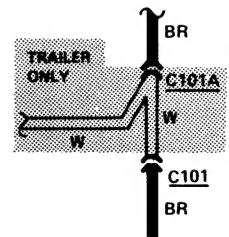
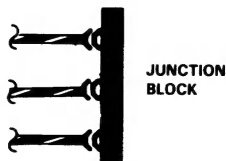
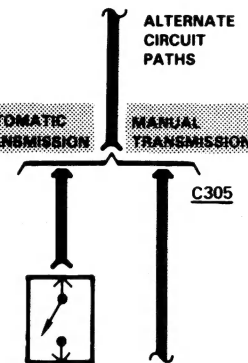
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY



"CUT" WIRES
REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND

BACKUP LIGHTS

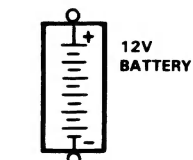
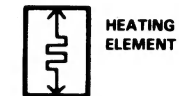
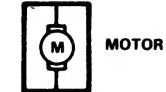
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE

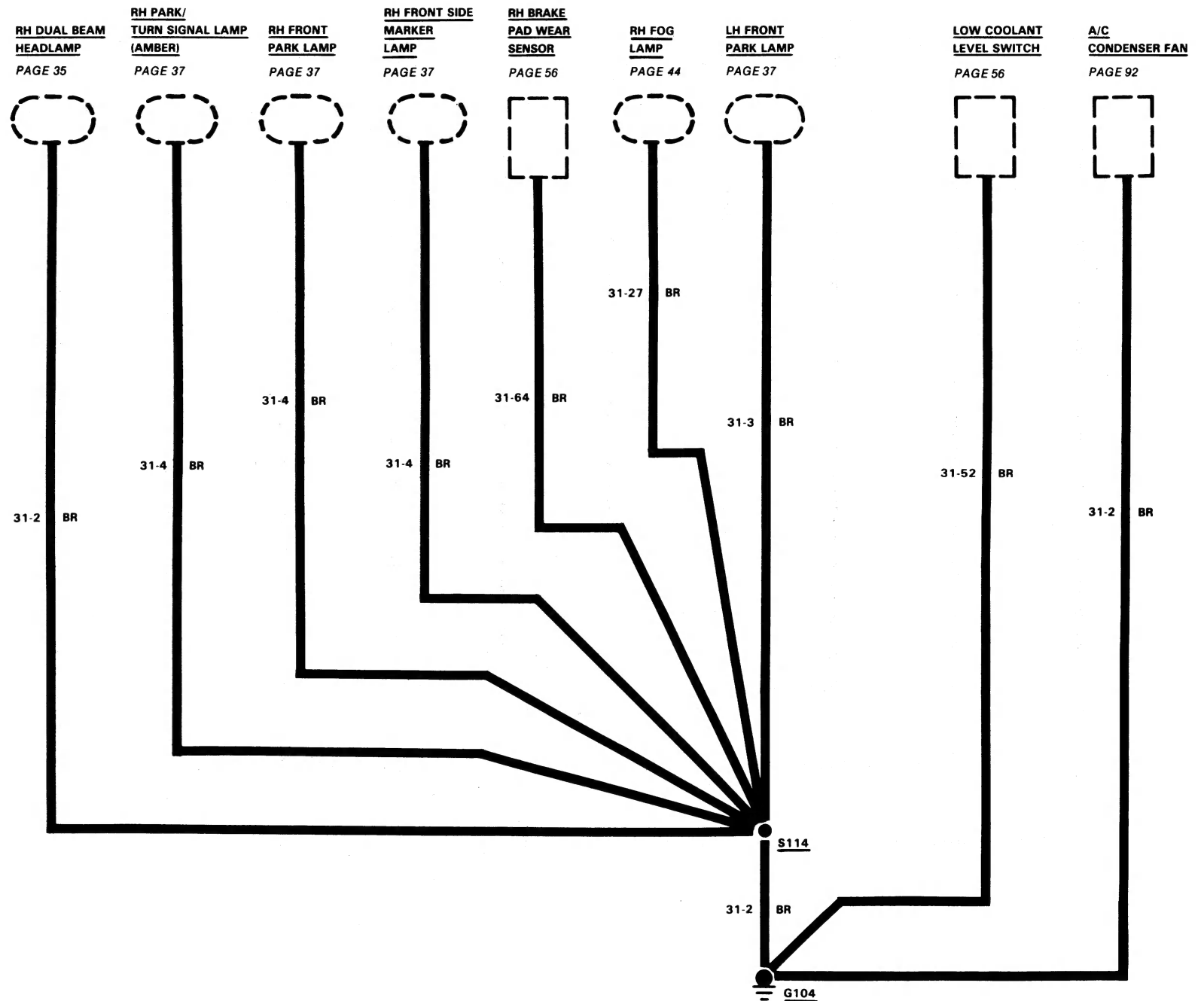


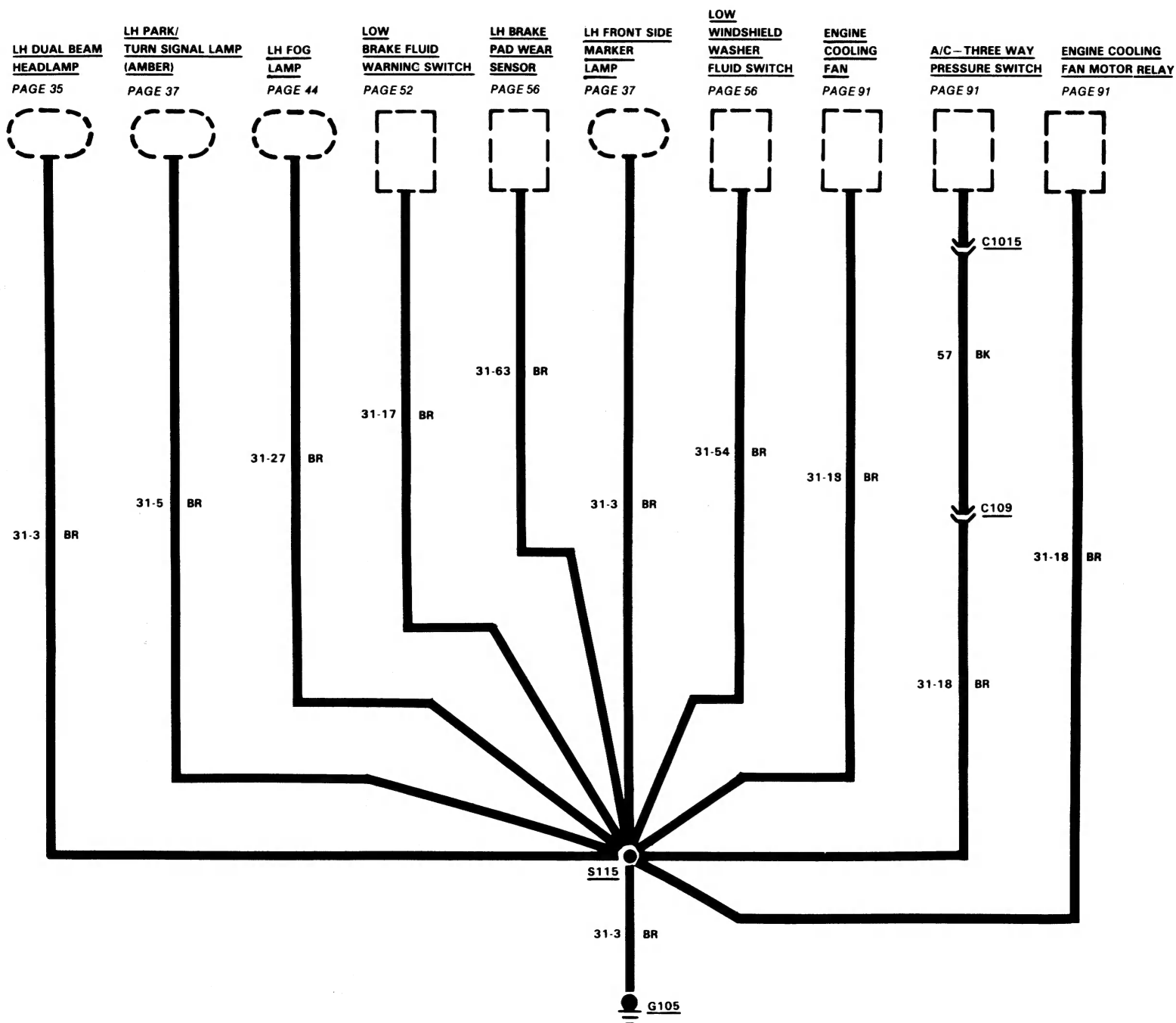
OPTIONAL WIRING
BR WIRES (INCLUDING C101) ARE ON ALL VEHICLES, BUT W WIRES (INCLUDING C101A) ARE USED ONLY WITH TRAILER

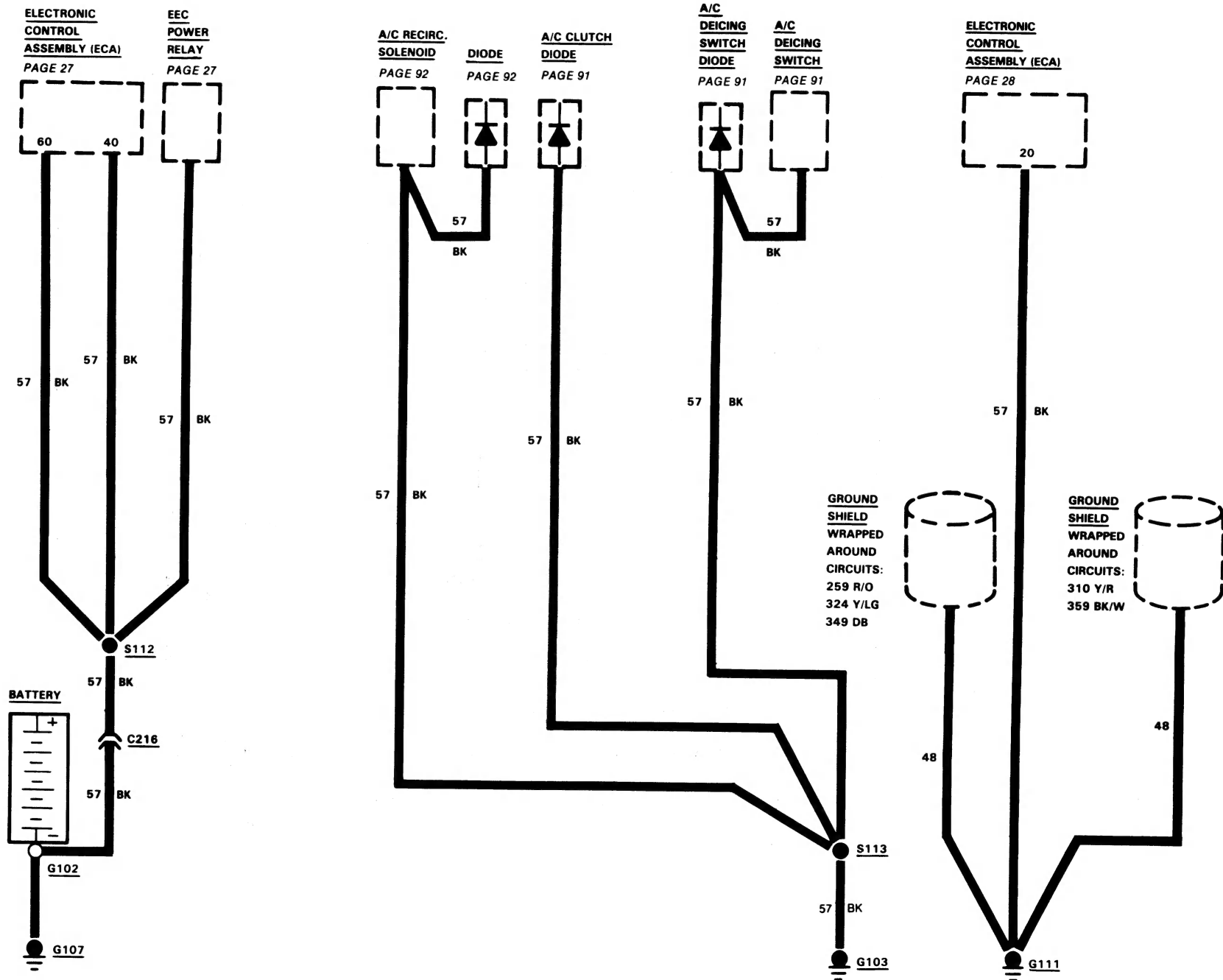
SEE GROUNDS PAGE 6, 7

DASHED WIRE CIRCUITRY
IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE

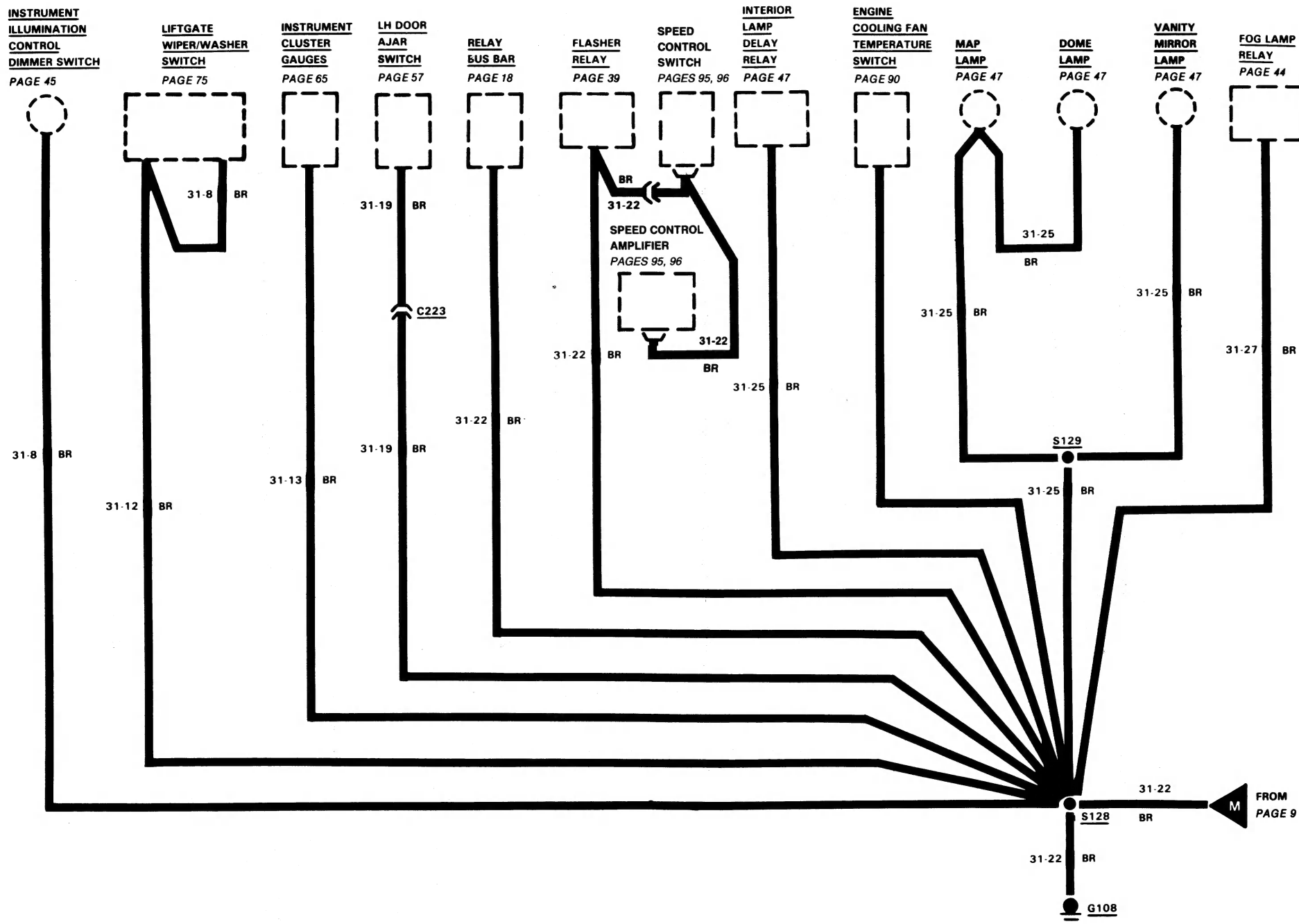


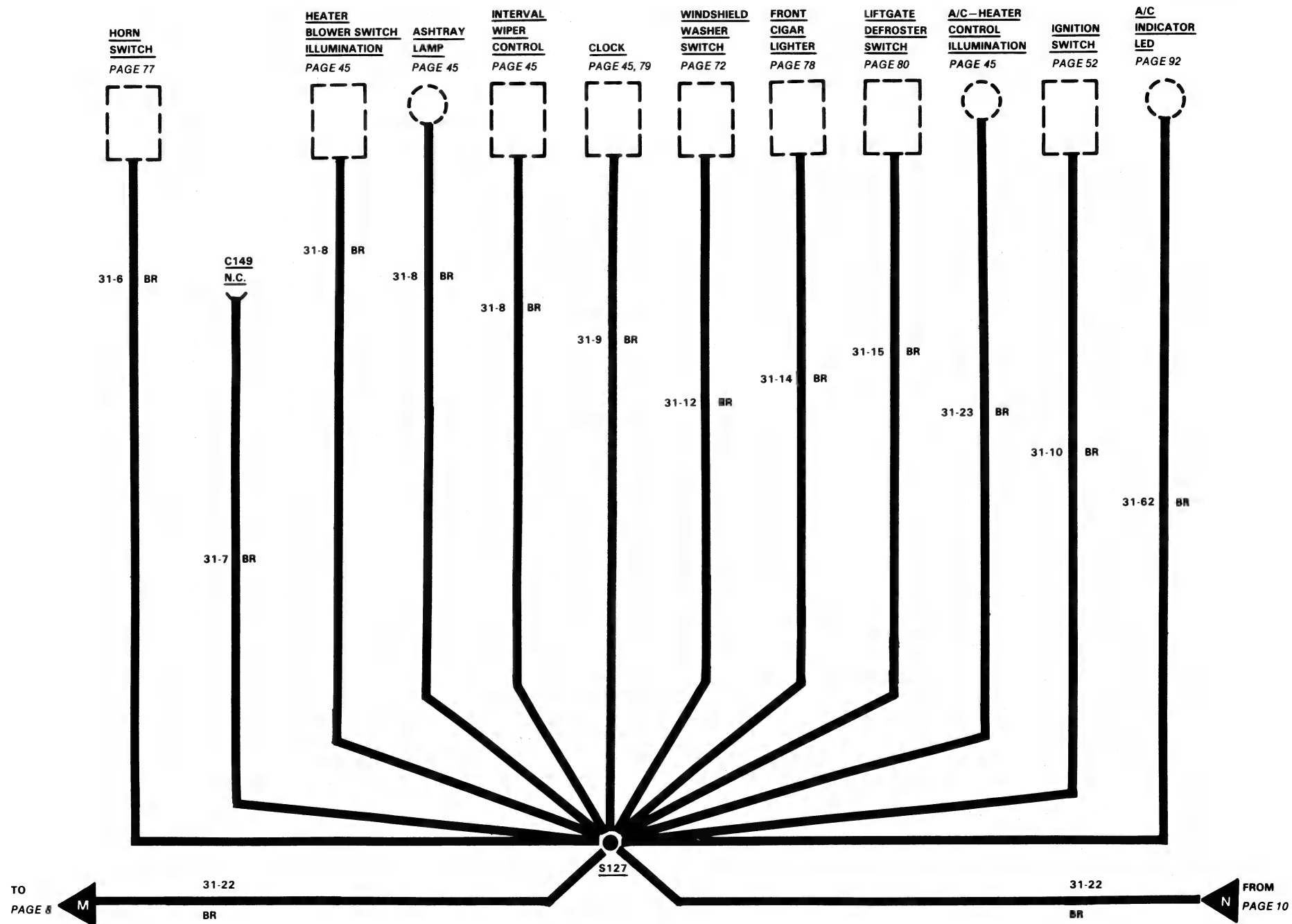


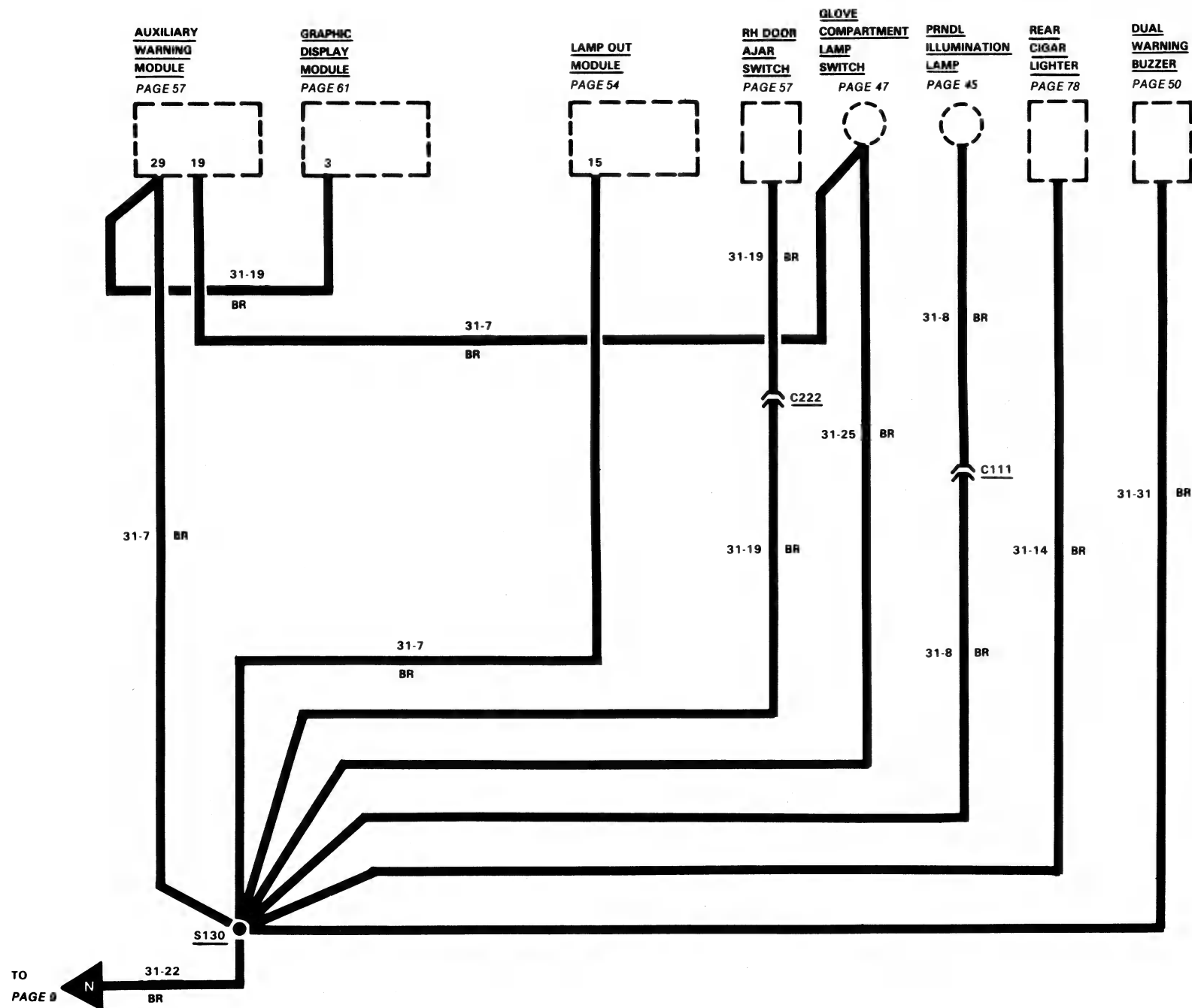


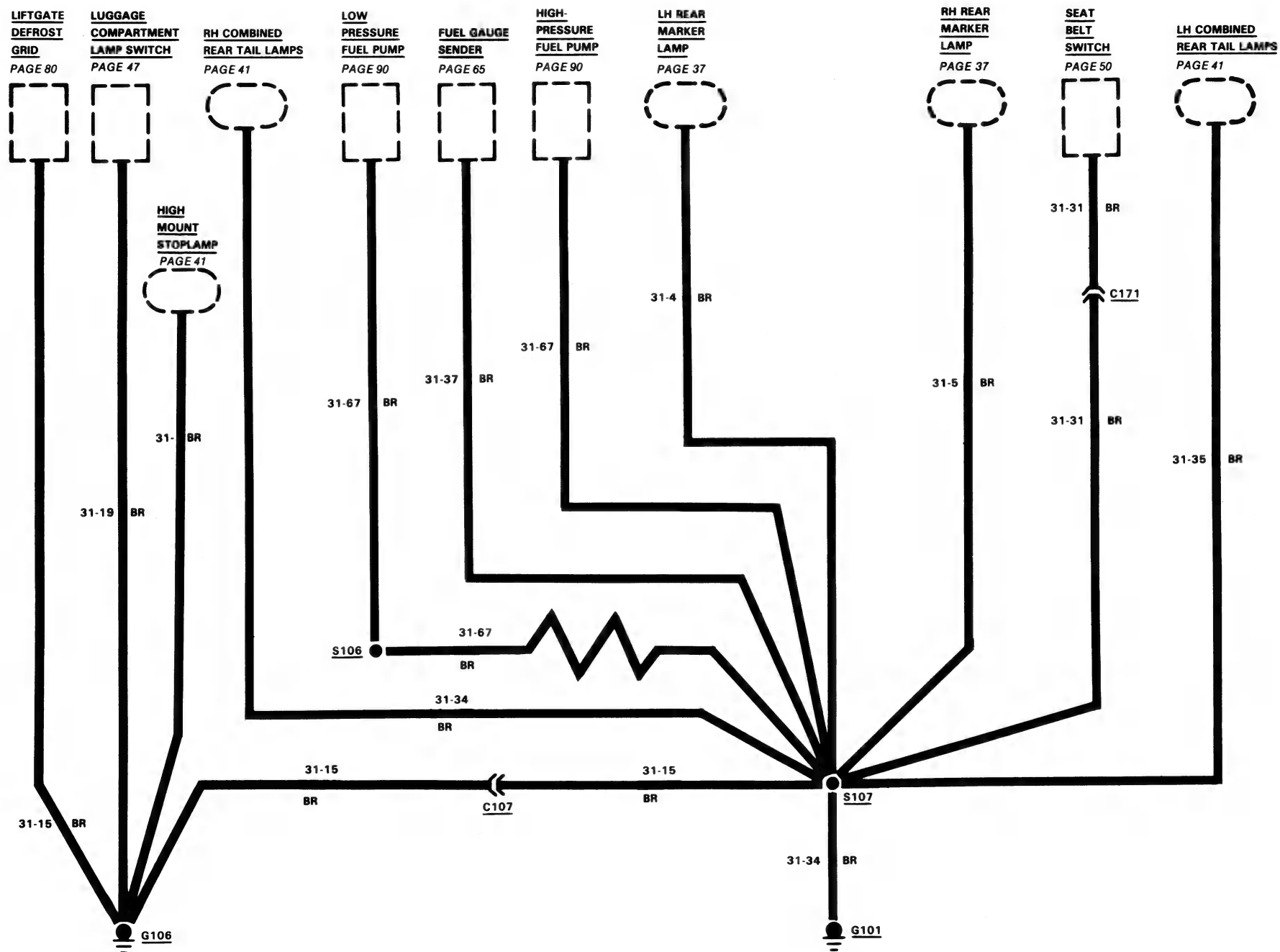


8 GROUND (G108)









12 GROUNDS

HOW THE CIRCUIT WORKS

The ground circuits here are complete, and connect several components together to screw terminal ground points. On other pages only parts of these circuits may be shown. Partial ground circuits are shown as dashed wires on these pages.

Simple or component ground circuits are shown on the individual circuit pages, and are complete on those pages.

The ground wires are **57 BK** for engine wiring or **31-XX** for body wiring, unless otherwise noted.

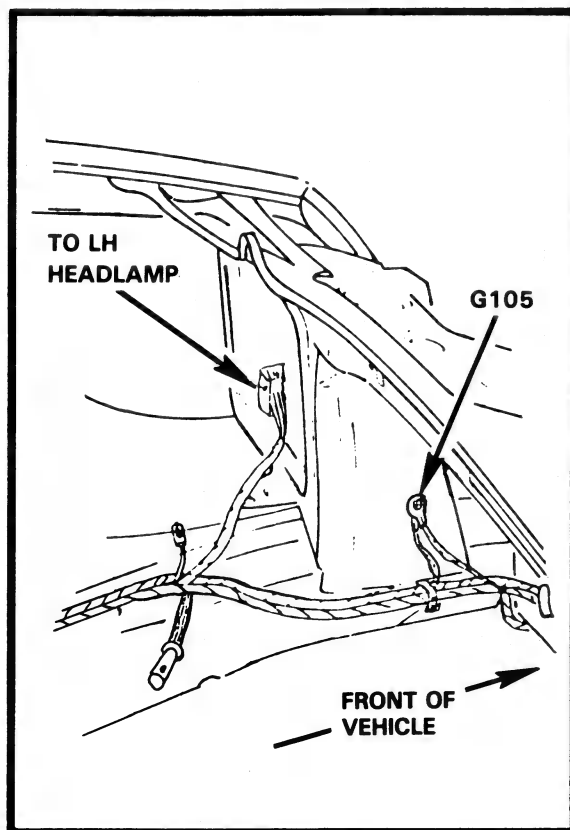


Figure 1 — Ground G105 — Inside of LH Front Fender

COMPONENT LOCATION

		Page-Figure	Color	Terminals
Connector C107	In liftgate, near door latch		BK	1
Connector C109	Near windshield washer bottle		NAT	2
Connector C111	Beneath console	84-4	BK	5
Connector C212	Behind center of I/P		BR	6
Connector C216	RH fender apron			1
Connector C149	Behind center of I/P	55-2	BK	5
Ground G101	Near license lamps			
Ground G102	RH rear side of engine compartment	33-2		
Ground G103	RH front of engine compartment			
Ground G104	RH side engine compartment near park lamp	21-1		
Ground G105	Near LH flasher	12-1		
Ground G106	In liftgate, near latch	12-2		
Ground G107	Battery ground			
Ground G108	LH cowl panel	13-3		
Ground G111	Lower RH cowl near ECA			
Splice S106	Lower back panel takeout	42-2		
Splice S107	LH rear panel, near liftgate			
Splice S112	RH rear of engine compartment			
Splice S113	Behind LH side of I/P	78-1		
Splice S114	RH side of engine compartment near horn			
Splice S115	LH side of engine compartment near horn			
Splice S127	Behind center of I/P	78-1		
Splice S128	Near LH door ajar switch	78-1		
Splice S129	Near interior lamp connector	49-4		
Splice S130	Near heated seat connector	78-1		

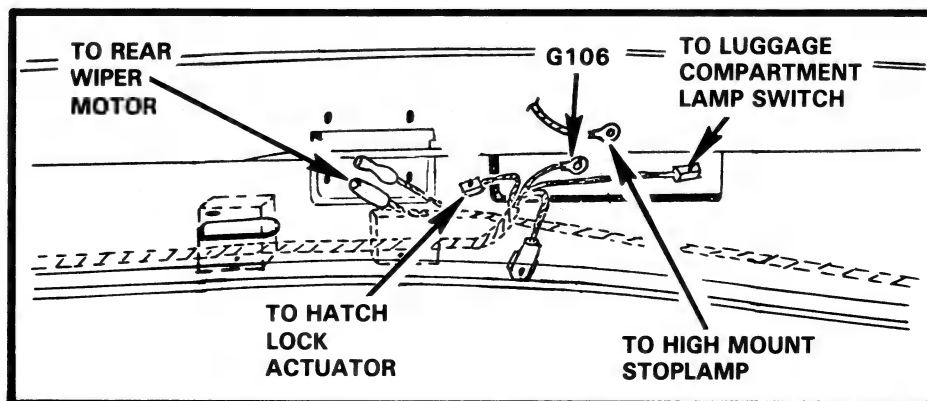


Figure 2 — Ground G106 — Rear Liftgate

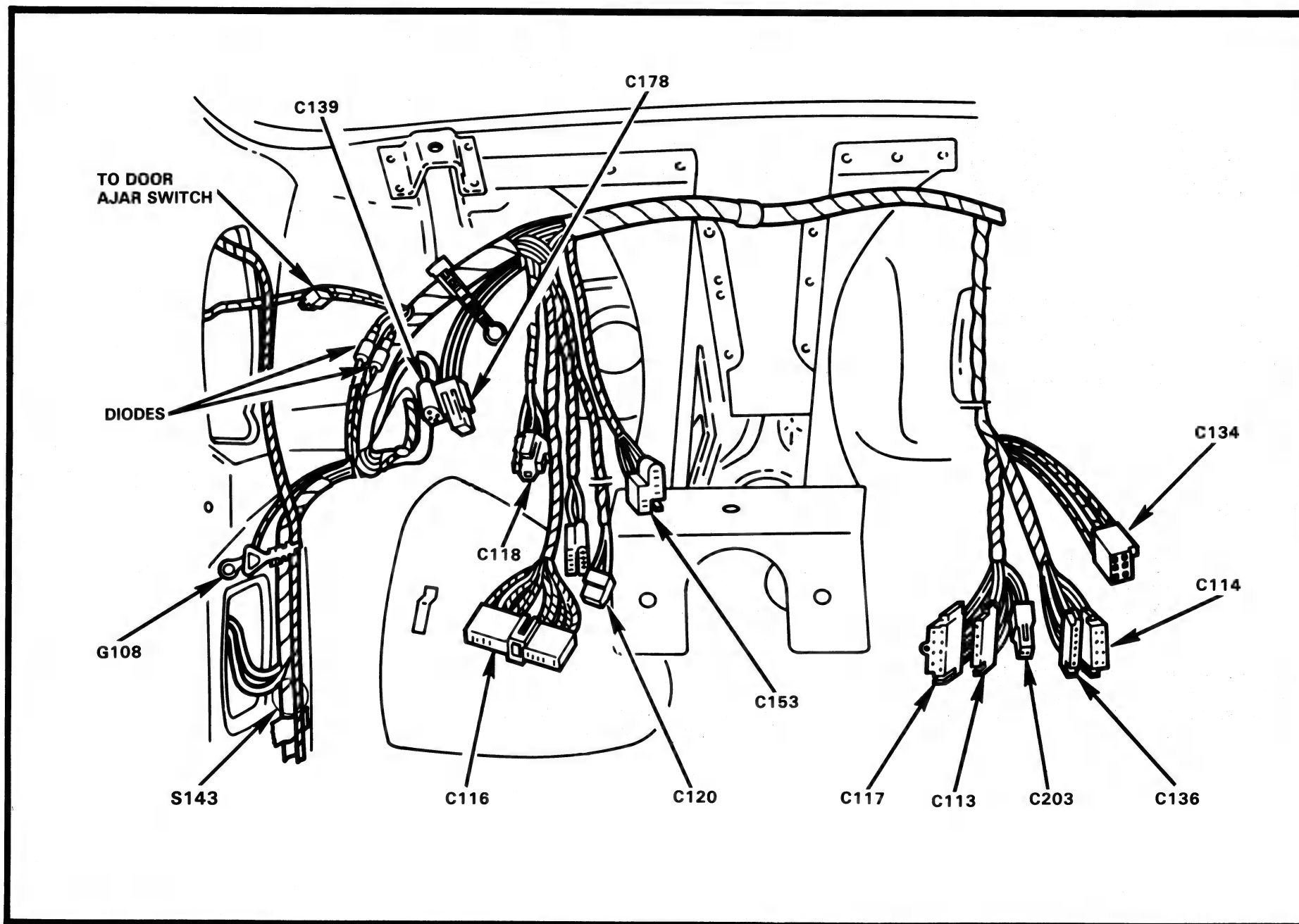
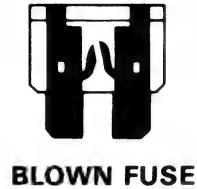


Figure 3 — Ground G108—LH I/P

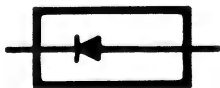
14 FUSE PANEL/CIRCUIT PROTECTION

REPLACEMENT OF FUSES



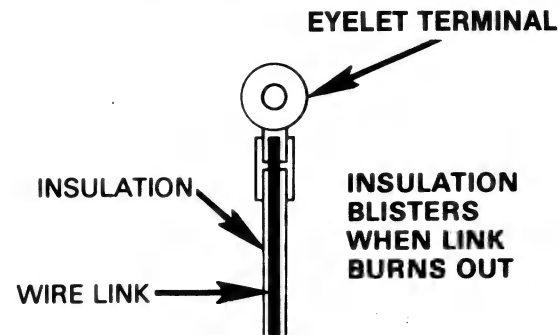
Fuses are mounted on either the **Fuse Panel** or in-line. They are identified by the numbered value in amperes, and by a color code. Be sure to replace a fuse with the same ampere rating. Remove fuses in order to check them.

DIODES



Diodes are electrical devices that permit current to flow in one direction only. The current flows in the direction indicated by the arrow.

FUSE LINKS



The fuse link is a short length of wire smaller in gage than the wire in the protected circuit. The wire is covered with a thick non-flammable insulation. An overload causes the link to heat and the insulation to blister. If the overload remains, the link will melt, causing an open circuit. The links are color coded for wire size as follows:

COLOR CODE

BLUE	20 GA
BROWN OR RED	18 GA
BLACK OR ORANGE	16 GA
GREEN	14 GA

When replacing, make tight crimp joints or hot solder joints for good connections.

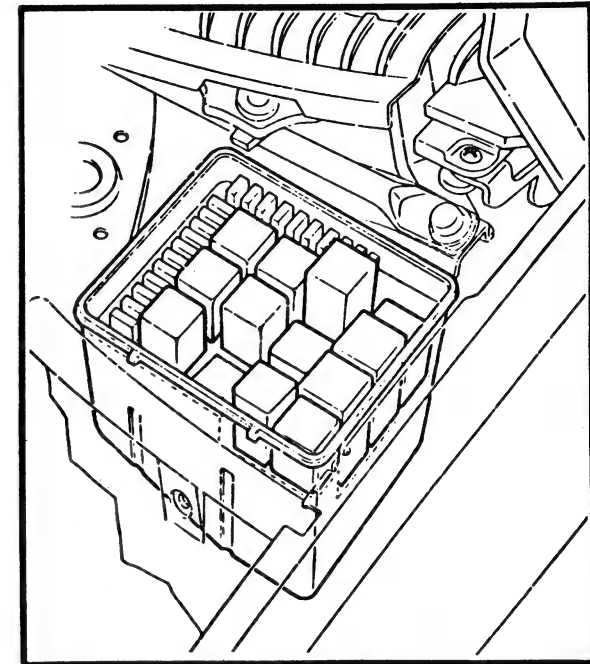
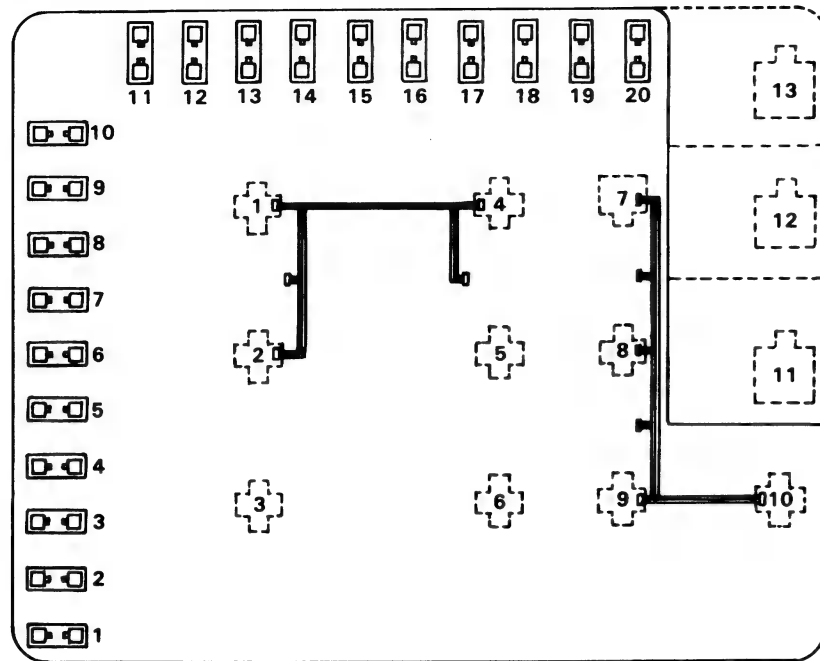


Figure1— Fuse Block

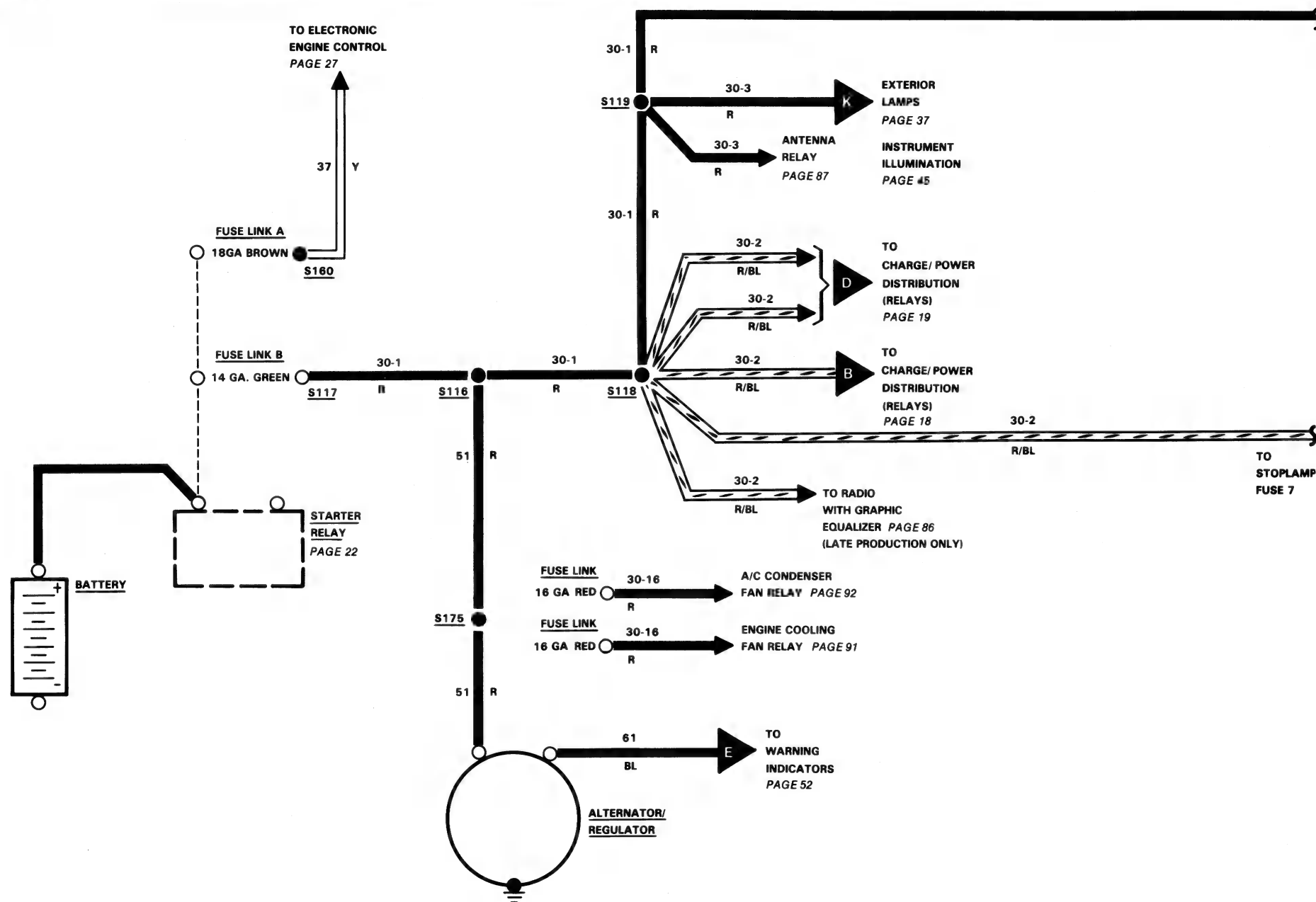


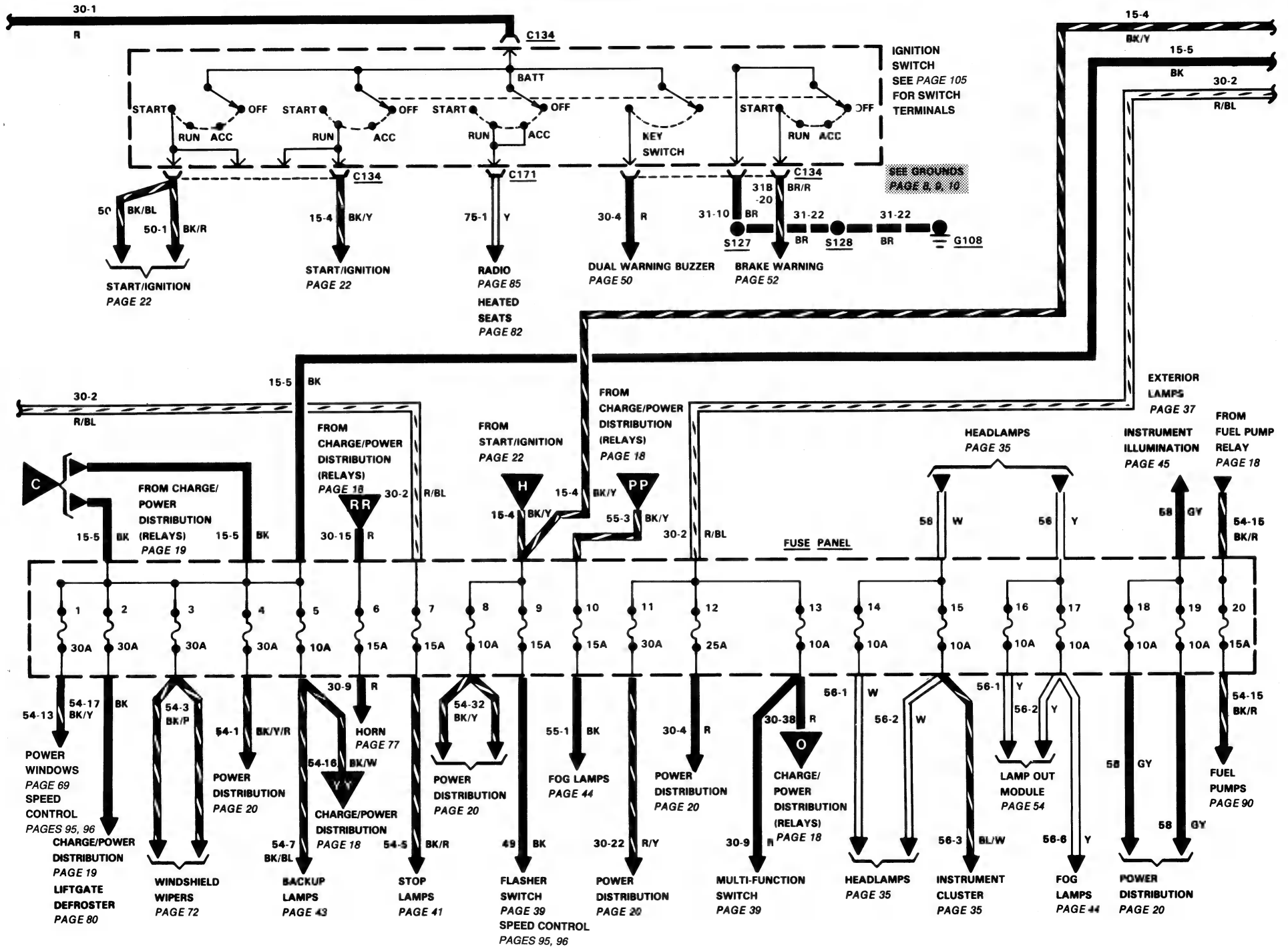
RELAY POSITION	CIRCUIT PROTECTED
1	A/C temp switch
2	Horn
3	A/C clutch W.O.T. cutout
4	Fuel pump
5	Fog lamps
6	
7	Interval windshield wipers
8	Stop lamp
9	Seat belt reminder
10	Ignition switch
11	Rear interval wipers
12	Interior lamp delay
13	Rear window defogger

FUSE VALUE AMPS	COLOR CODE
4	PINK
5	TAN
10	RED
15	LIGHT BLUE
20	YELLOW
25	NATURAL
30	LIGHT GREEN

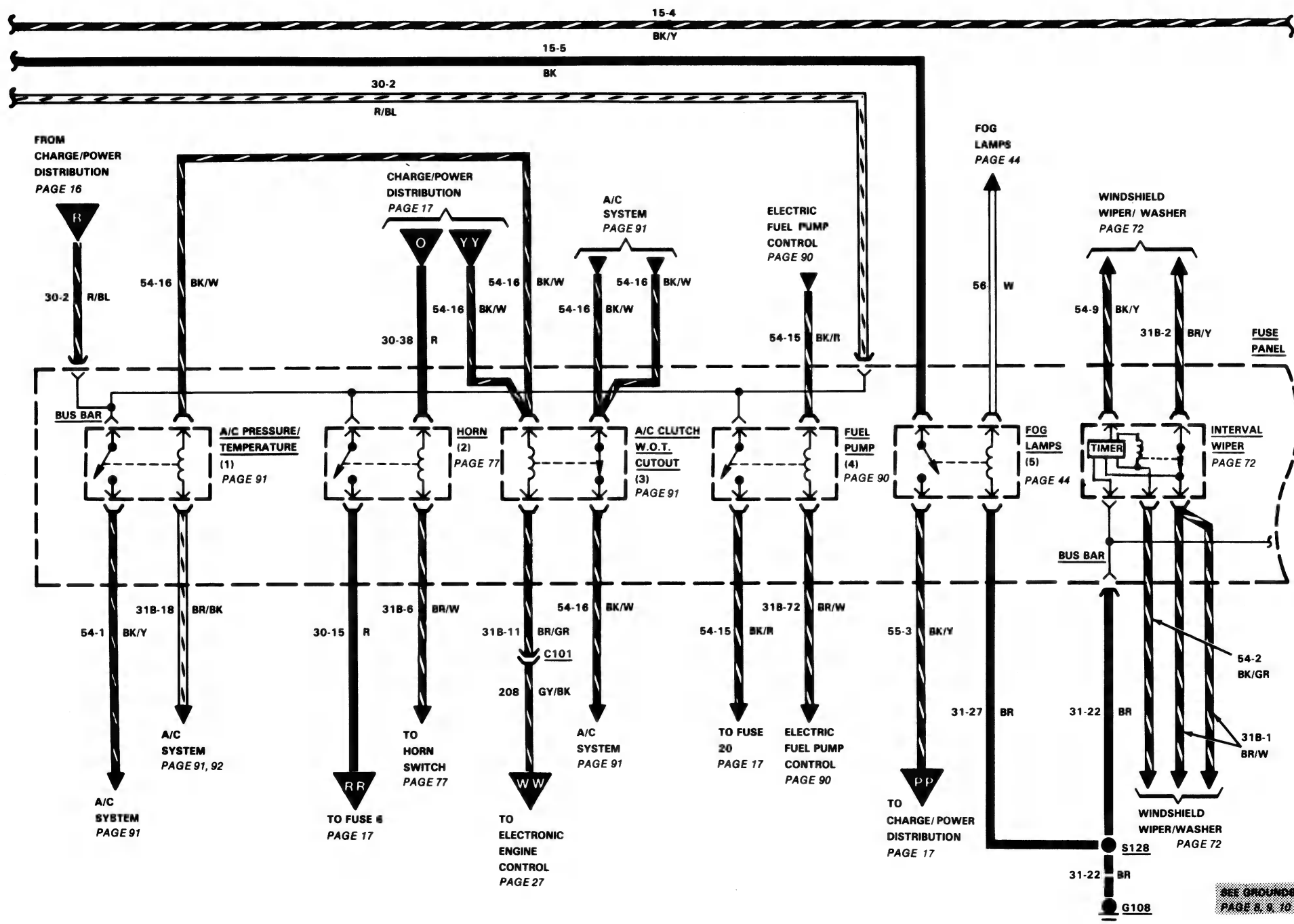
FUSE POSITION	AMPS	CIRCUITS PROTECTED
1	30	Power windows, power door locks, speed control
2	30	Rear window defroster
3	30	Windshield wipers
4	30	Heater blower, rear wipers, windshield wash, A/C switch, engine and A/C cooling fans
5	10	Backup lamps, W.O.T. relay
6	15	Horns
7	15	Stop lamps
8	10	Clock, auxiliary warning module, instrument cluster, gauges, bulb outage module
9	15	Hazard flashers, turn signals, speed control
10	15	Fog lamps
11	30	A/C temperature fan, power door locks, power mirrors, heated seats
12	25	Courtesy lamps, cigar lighters, vanity mirror
13	10	Hazard flashers, horn relay
14	10	LH headlamp high beam
15	10	RH headlamp high beam
16	10	LH headlamp low beam
17	10	RH headlamp low beam
18	10	LH front parking lamp, LH tail lamp, rear side marker lamps, underhood lamp, and license lamps
19	10	I/P illumination control, RH front parking lamp, RH tail lamp, and front side marker lamps
20	15	Fuel pump

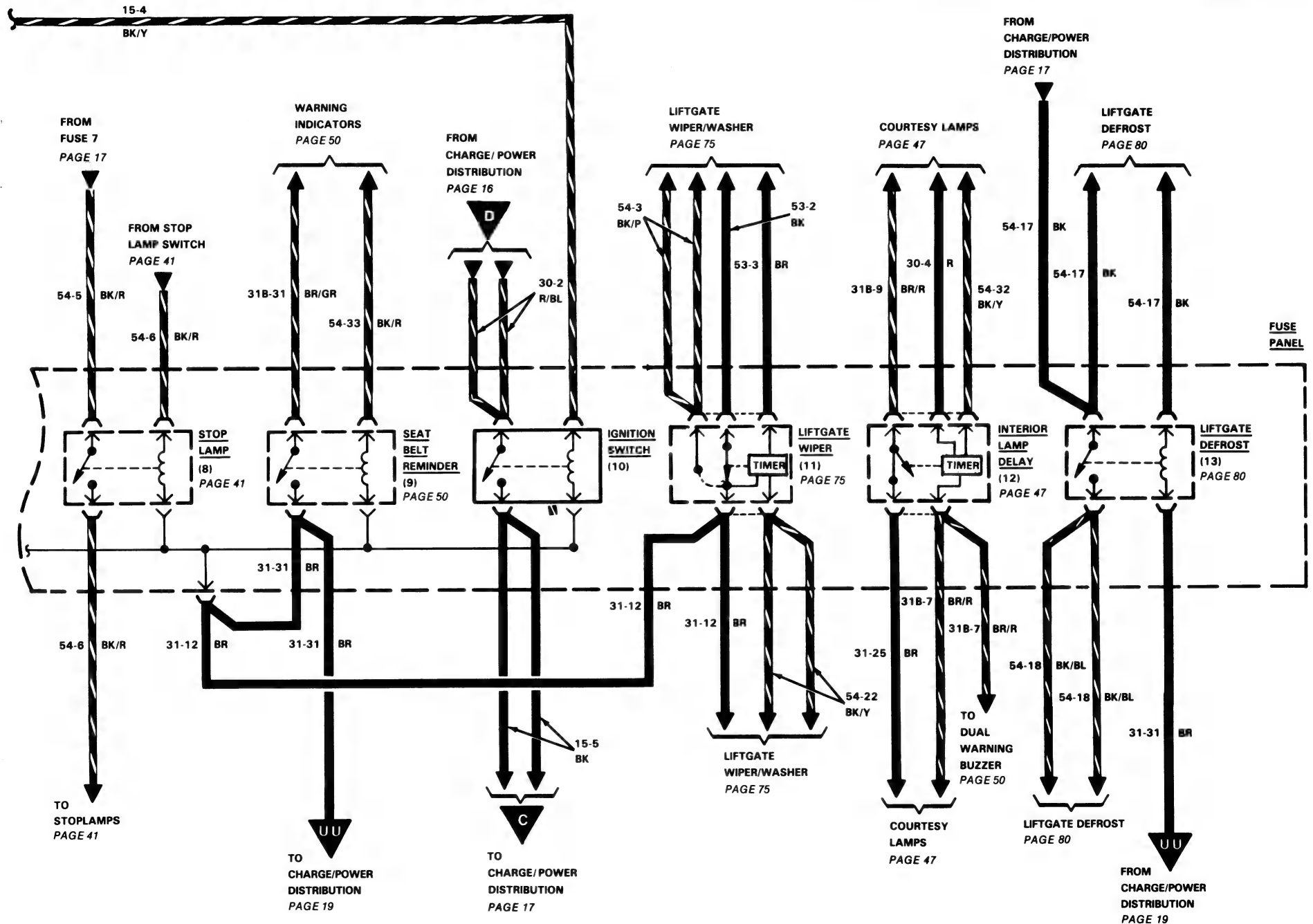
16 CHARGE/POWER DISTRIBUTION





18 CHARGE/POWER DISTRIBUTION (RELAYS)





FUSE PANEL
PAGE 17

FUSE 11
11
30A

POWER DOOR LOCKS
PAGE 67

POWER MIRRORS
PAGE 70

HEATED SEATS
PAGE 82

30-22 R
30-37 R
30-22 R/Y
C140
30-33 R
C143
30-33 R

HOW THE CIRCUIT WORKS

Power Distribution

The **Battery** is connected directly to the **Starter Relay** hot terminal. From the **Starter Relay** hot terminal, current flows through **Fuse Link A** and **Fuse Link B** to power all the other circuits except the engine and A/C condenser fans.

TROUBLESHOOTING HINTS

IMPROPER CHARGING

The most common charge system complaints are dead **Battery**, and **Alternator Warning Indicator** on at normal speed.

- Check **Fuse Link B** at **Starter Relay**.
- Check **Alternator** belt tension.
- Check **Battery** terminals and cable clamps.
- Check for clean and tight connections on **Alternator**, **Voltage Regulator**, and **Starter Relay**.

Read "Charging System Diagnosis" in Section 31-01 of Shop Manual for detailed **Charging System** tests.

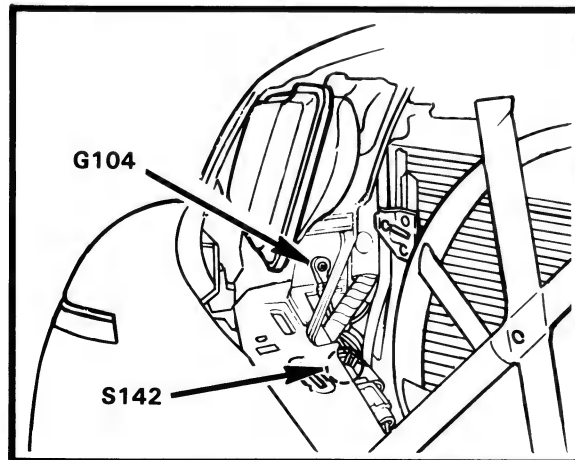
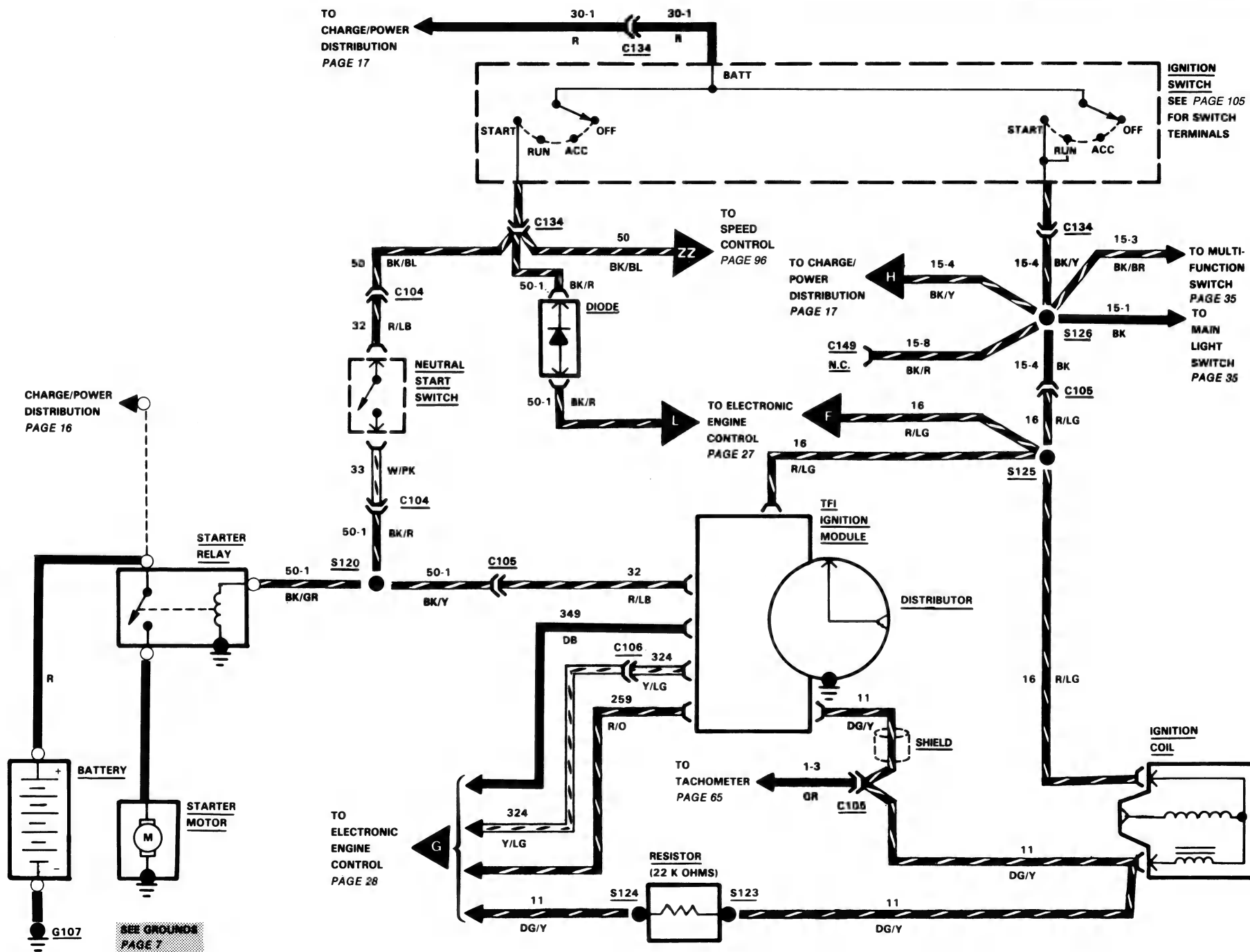


Figure 1 — Front Bumper Wiring

COMPONENT LOCATION

		Page-Figure	Color	Terminals
Alternator	Front LH side of engine			
Fuse Link B	At starter relay	26-4		
Starter Relay	RH fender apron	26-4		
Connector C134	At ignition switch	13-3	BR	6
Connector C140	Behind LH side of I/P	55-2	RED	2
Connector C143	Below console	55-2	BK	2
Connector C149	Behind center of I/P	55-2	GY	2
Connector C171	At seat belt switch	26-6		
Ground G108	LH side I/P near foglamp switch T/O	13-3		
Splice S116	RH front of engine compartment below coolant reservoir			
Splice S117	At starter relay			
Splice S118	LH side I/P, near foglamp switch T/O			
Splice S119	Near ignition switch T/O			
Splice S127	Behind center of I/P	78-1		
Splice S128	LH side along frame	78-1		
Splice S131	Near LH door ajar switch T/O behind I/P	78-1		
Splice S133	Center of I/P, near tripminder			
Splice S135	Near LH door ajar switch T/O behind I/P	78-1		
Splice S136	Near dome/map lamp	49-4		
Splice S137	Behind center of I/P	78-1		
Splice S138	Near LH door ajar switch T/O behind I/P	78-1		
Splice S139	Near rear wiper switch T/O	78-1		
Splice S140	Near dual warning buzzer T/O	78-1		
Splice S141	Below windshield washer bottle			
Splice S142	Near RH side of condenser fan	21-1		
Splice S160	RH fender apron near starter relay			
Splice S175	Near alternator T/O			

22 START/IGNITION



START

HOW THE CIRCUIT WORKS

The **Battery**, **Starter Motor**, **Starter Relay**, and **Ignition Switch** make up the **Starting System**. In vehicles with automatic transmission, the **Back-up/Neutral Safety Switch** must be closed (PARK or NEUTRAL) in order to operate the **Starter Motor**.

Turning the **Ignition Switch** to START sends current through the **Starter Relay** coil and operates the relay. Current from the **Battery** then flows directly through the **Starter Relay** to the **Starter Motor** to start the engine.

When the **Ignition Switch** is in START, **Battery** voltage is applied to both the START (circuit 32) and RUN (circuit 16) terminals of the **Thick Film Integrated Design Ignition (TFI) Module**. When the Ignition Switch is released to the RUN position, the voltage on circuit 32 goes to zero.

TROUBLESHOOTING HINTS

CHECK BATTERY AND CABLES

- Check condition of **Battery**. Recharge or replace if necessary.
- Check **Battery** posts and cable lugs.
- Check cable terminals at **Starter Relay**, engine ground, and **Starter Motor**, and clean if necessary. Make sure cable wire strands are securely attached in terminals. Cables are tight when eyelet can't be easily turned by hand.

IF BATTERY CRANKS SLOWLY

- Check **Battery** and cables (see above).
- If still slow, repair or replace **Starter Motor**.

IF STARTER RELAY CHATTERS OR DOESN'T CLICK

- Check **Battery** and cables (see above).

COMPONENT LOCATION

		Page-Figure	Color	Terminals
Alternator	LH side of engine			
Ignition Coil	LH fender apron	25-3		
Ignition Switch	In steering column			
Neutral Start Switch	Part of transmission assembly	43-1		
Starter Relay	LH fender apron	26-4		
TFI Ignition Module	Mounted to distributor	24-2		
Connector C104	Beneath center of vehicle, near transmission	43-1		4
Connector C105	LH front fender apron	25-3	GY	8
Connector C106	LH fender apron near distributor			2
Connector C134	At steering column to ignition switch	13-3, 26-6	BR	6
Connector C149	Behind center of I/P	55-2		
Ground G104	RH of engine compartment near parking lamp	21-1		
Splice S120	In engine compartment near dash panel			
Splice S123	LH fender apron near distributor			
Splice S124	LH fender apron near distributor			
Splice S125	LH front fender apron			
Splice S126	Near ignition switch T/O	78-1		

- Make sure **Starter Relay** bracket is grounded tightly.
- With R/LB wires removed from **Starter Relay**, and transmission in PARK or NEUTRAL, jumper this terminal on **Starter Relay** to main terminal (**Battery** connection). If **Starter Motor** works, check **Ignition Switch** and **Neutral Switch** on transmission. Check wiring to **Starter Relay** for open or dirty connections. If this jumper doesn't operate **Starter Relay**, replace it.

IF STARTER DOES NOT CRANK AND STARTER RELAY CLICKS

- Clean and tighten cable connection to **Starter Motor** terminal and relay terminals. Check cable to **Starter Motor** for damage and make sure wire strands are secure in eyelets.

- If still bad, repair or replace **Starter Motor**.

IF STARTER SPINS (HUMMING NOISE) BUT DOES NOT CRANK ENGINE

- Remove **Starter Motor**. Repair or replace starter drive.
- Read "Testing" in Section 28-02 of Shop Manual for detailed Starting System tests.

IGNITION

HOW THE CIRCUIT WORKS

The Merkur Ignition system contains **Thick Film Integrated Design Ignition (TFI) Module**, which is mounted on the side of the **Distributor**. The **Distributor** is vertically mounted, and driven by the engine camshaft gear.

When the engine is cranking or running:

- The magnetic pickup in the **Distributor** sends pulse to the **TFI Module** as the tooth on the armature passes the magnet on the stator.
- The **TFI Module** switches current on and off in the primary circuit of the **Ignition Coil** according to the **Distributor** pulses:
- Each interruption of primary current makes the **Ignition Coil** secondary produce an open circuit high-voltage pulse of up to 40,000 volts;
- High voltage pulses are transmitted to the **Distributor**, which sends them to fire the spark plugs.

TROUBLESHOOTING HINTS

The following steps are intended only as quick checks to identify and locate some of the more frequent problems. If these checks do not solve the problem, refer to the **Ignition System** diagnosis procedures in the Engine/Emissions Diagnosis Manual for complete system tests.

If the **Ignition System** is OK, check the fuel system and the engine itself.

PRELIMINARY CHECKS

- a. Check **Battery** for proper state of charge and for clean, tight battery terminal connections.
- b. Inspect all wires and connectors for breaks, cuts, abrasions or burned spots. Repair or replace as necessary. Make sure all wires are connected correctly.
- c. Unplug all connectors and inspect for corroded or burned contacts. Repair as necessary and plug connectors back together. Do NOT remove grease in connectors.
- d. Check for loose or damaged spark plug or coil wires. If boots or nipples are removed on ignition wires, reapply new silicone dielectric compound.
- e. Check that **TFI Module** is securely attached to **Distributor**.

SPECIAL TEST JUMPER

Make up a test jumper as shown in Figure 1 below. It is important to use only this test jumper when making these checks. Solid wire jumpers will not work for the quick checks.

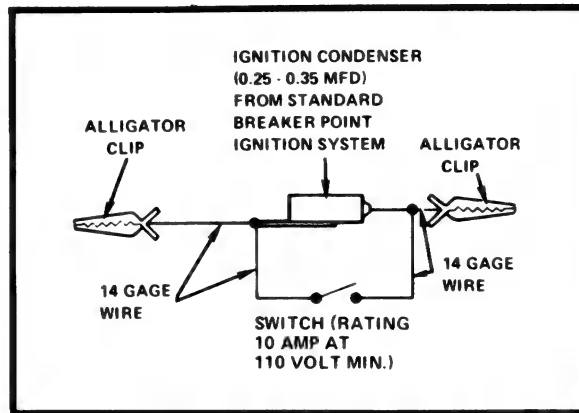


Figure 1 — Ignition Test Jumper

VOLTAGE TEST

Disconnect connector at **TFI Module**. Check for battery voltage between each pin (+) and ground (–) as follows (use a straight pin in connector socket hole to make contact):

- a. With **Ignition Switch** in OFF position, check for 0 volts at each terminal.
 - If voltage is present, check **Ignition Switch**.
- b. Set **Ignition Switch** to RUN. Check for battery voltage at R/LG and DB/Y wires.
 - Check continuity of **Ignition Switch**, **Ignition Coil**, and wires if bad.
- c. Disconnect R/LB wire lug at **Starter Relay**. Set **Ignition Switch** to START. Check for battery voltage at all three wires.
 - Check continuity of **Ignition Switch** and R/LB wires if bad.
- d. Reconnect R/LB wire lug at **Starter Relay**.

RUN MODE SPARK TEST

- a. Remove coil wire from **Distributor** cap. Install spark tester or modified spark plug (side electrode removed) in coil wire terminal.
- b. Unplug connector at **TFI Module**. In the harness side of the connector, connect the special test jumper (Figure 1) between ground and the DG/Y lead. Use a straight pin in connector socket hole to make contact.

CAUTION

Do not leave test jumper closed for more than one second at a time.

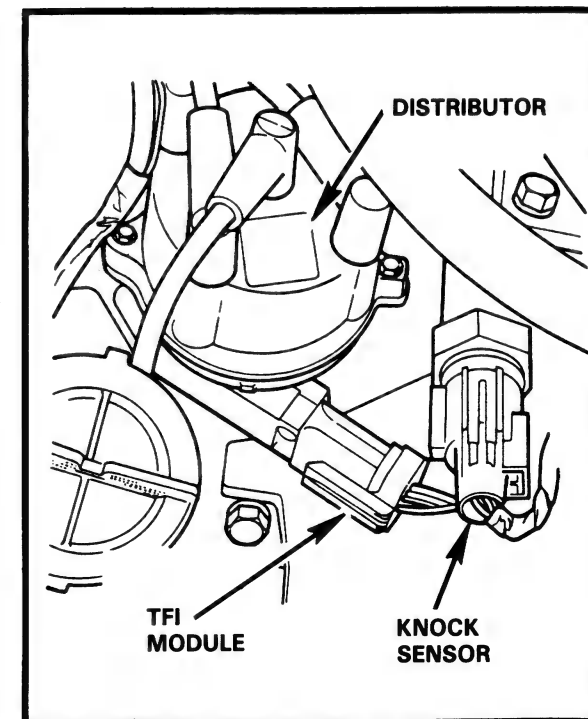


Figure 2 — Distributor

c. With the Ignition Switch in RUN, close the test jumper switch. Leave closed for about one second, then open. Repeat this several times. There should be a SPARK each time this switch is opened.

- If there is NO SPARK, the problem is in the primary circuit. Check coil for internal shorts or opens. Check primary resistance (0.5 ohm) and secondary resistance (8000 to 11,500 ohms). Replace coil if necessary.
- If there is SPARK, the primary circuit wiring and coil are OK. The problem is in the Distributor pickup, or the TFI Module.

DISTRIBUTOR PICKUP TEST

1. There is no access to the output of the Hall effect pick-up device in the EEC-IV distributor.

Refer to applicable Section in Engine/Emissions Diagnosis Manual for distributor diagnostics utilizing outputs from EEC-IV module.

CAUTION

If the vehicle has a catalytic converter, disconnect the air supply line between the By-pass Valve and the Manifold before cranking the engine with the Ignition Switch in OFF. This will prevent damage to the catalytic converter.

After testing, run the engine for at least 3 minutes before reconnecting the air supply line to clear excess fuel from the exhaust system.

NOTE

Do not use a voltmeter which is combined with a dwell-meter. Slight needle oscillations (1/2 volt) may not be detectable on this type of test unit.

CAUTION

Do not crank engine for more than 10 seconds.

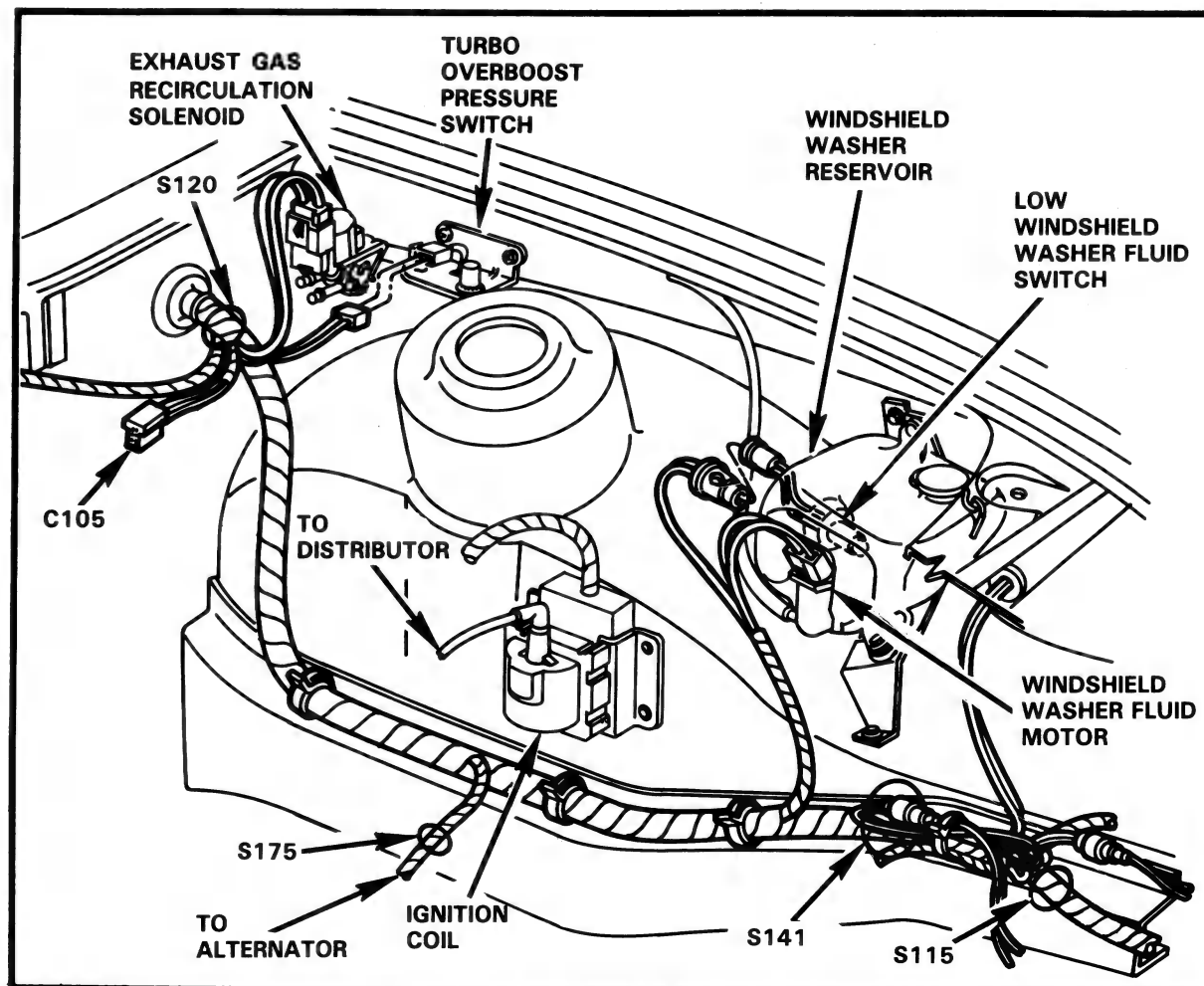


Figure 3—LH Fender Apron

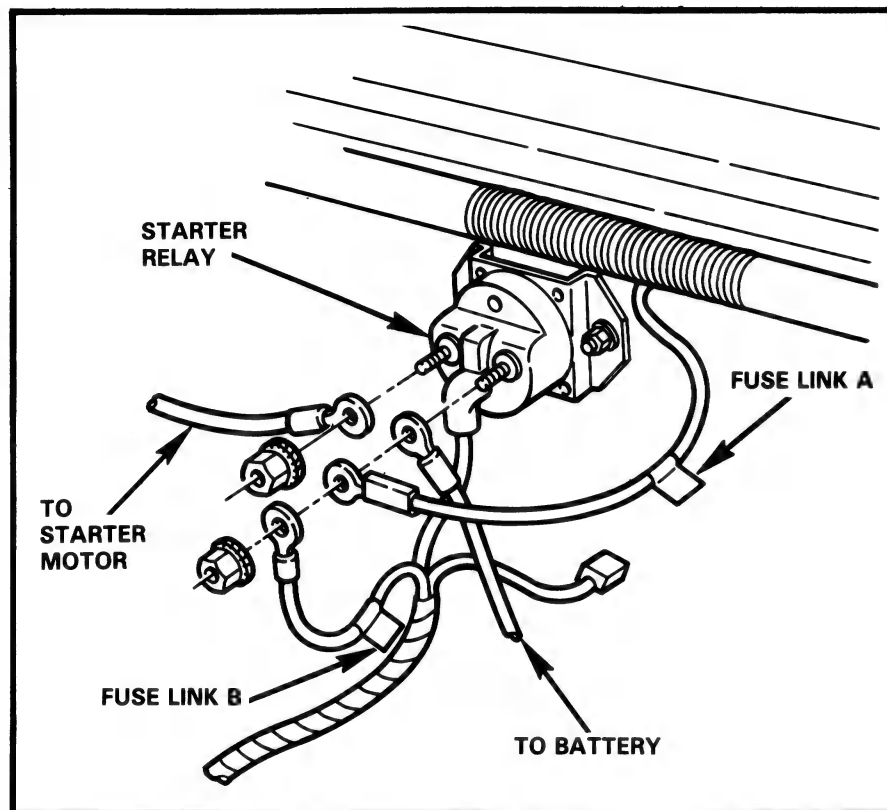


Figure 4—Starter Relay

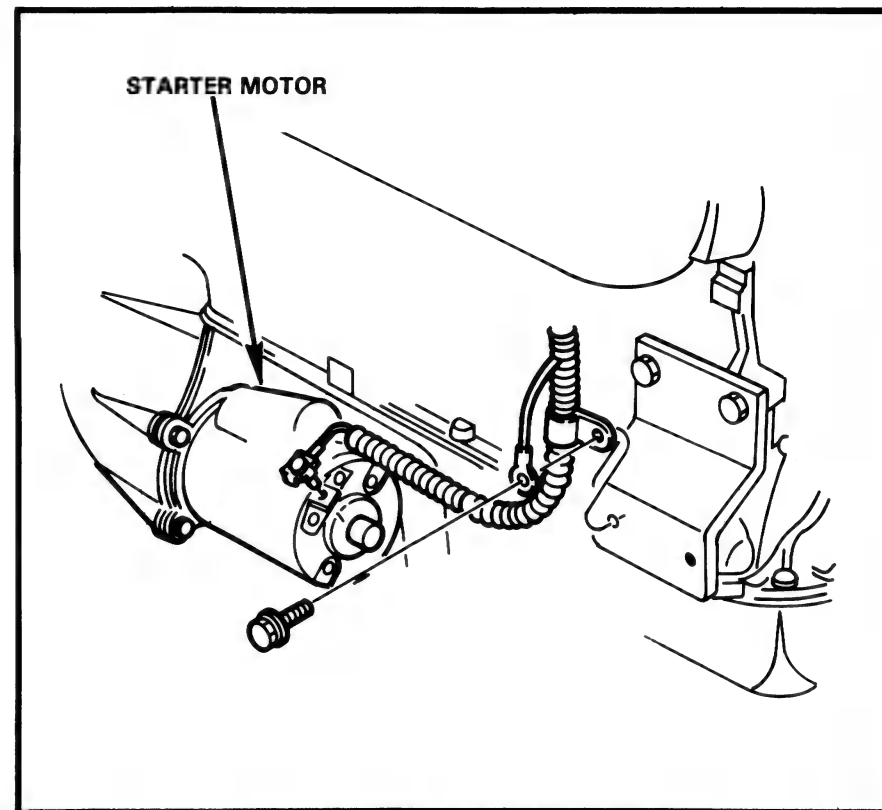


Figure 5—Starter Motor

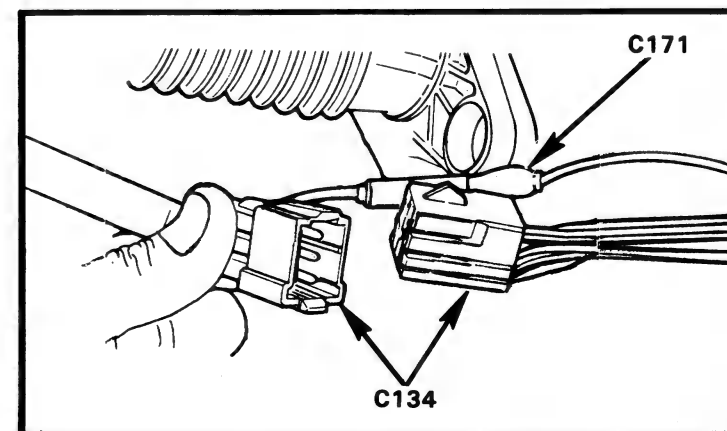
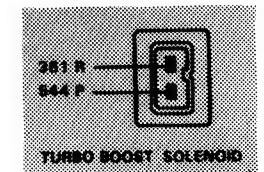
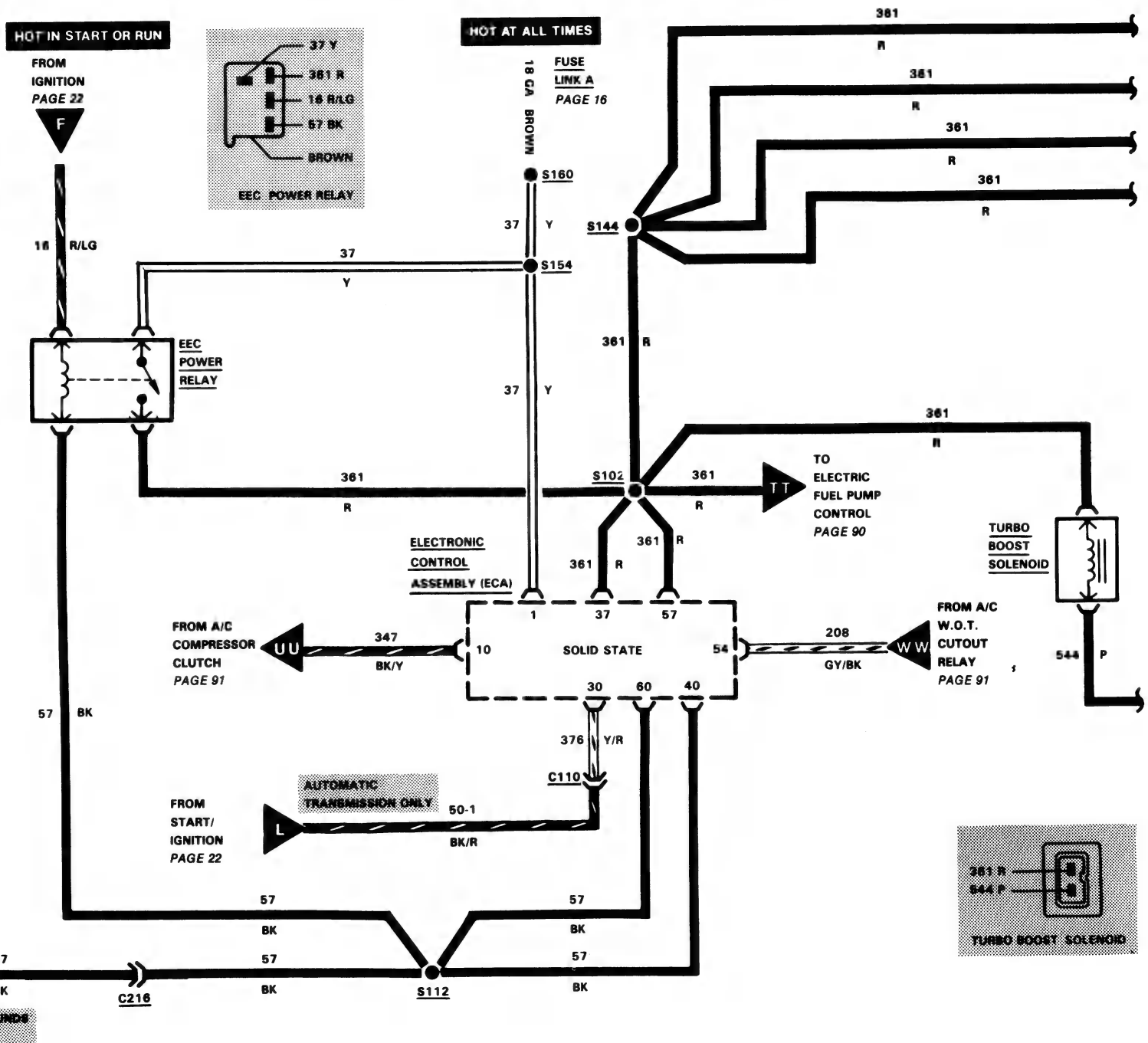
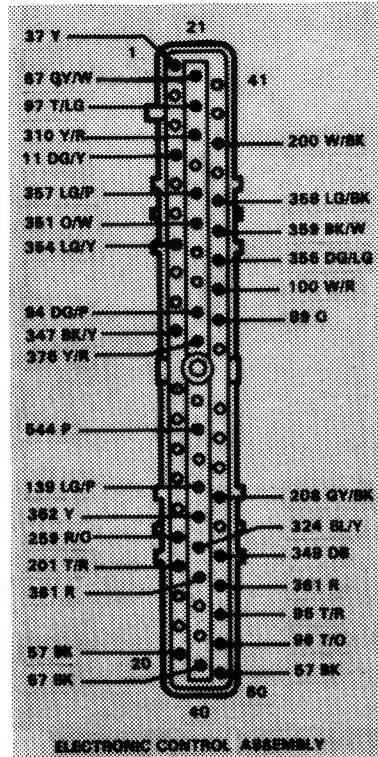
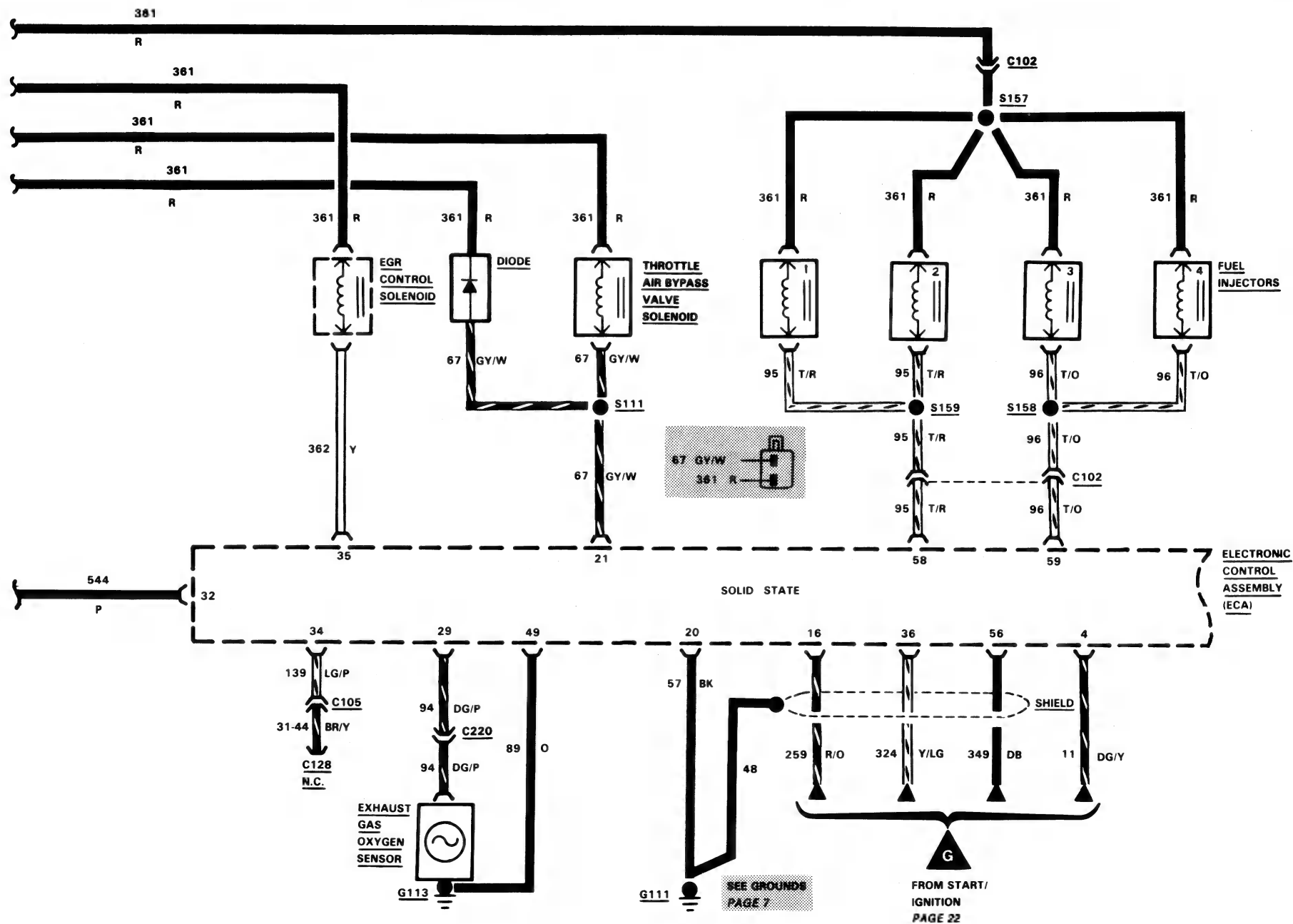
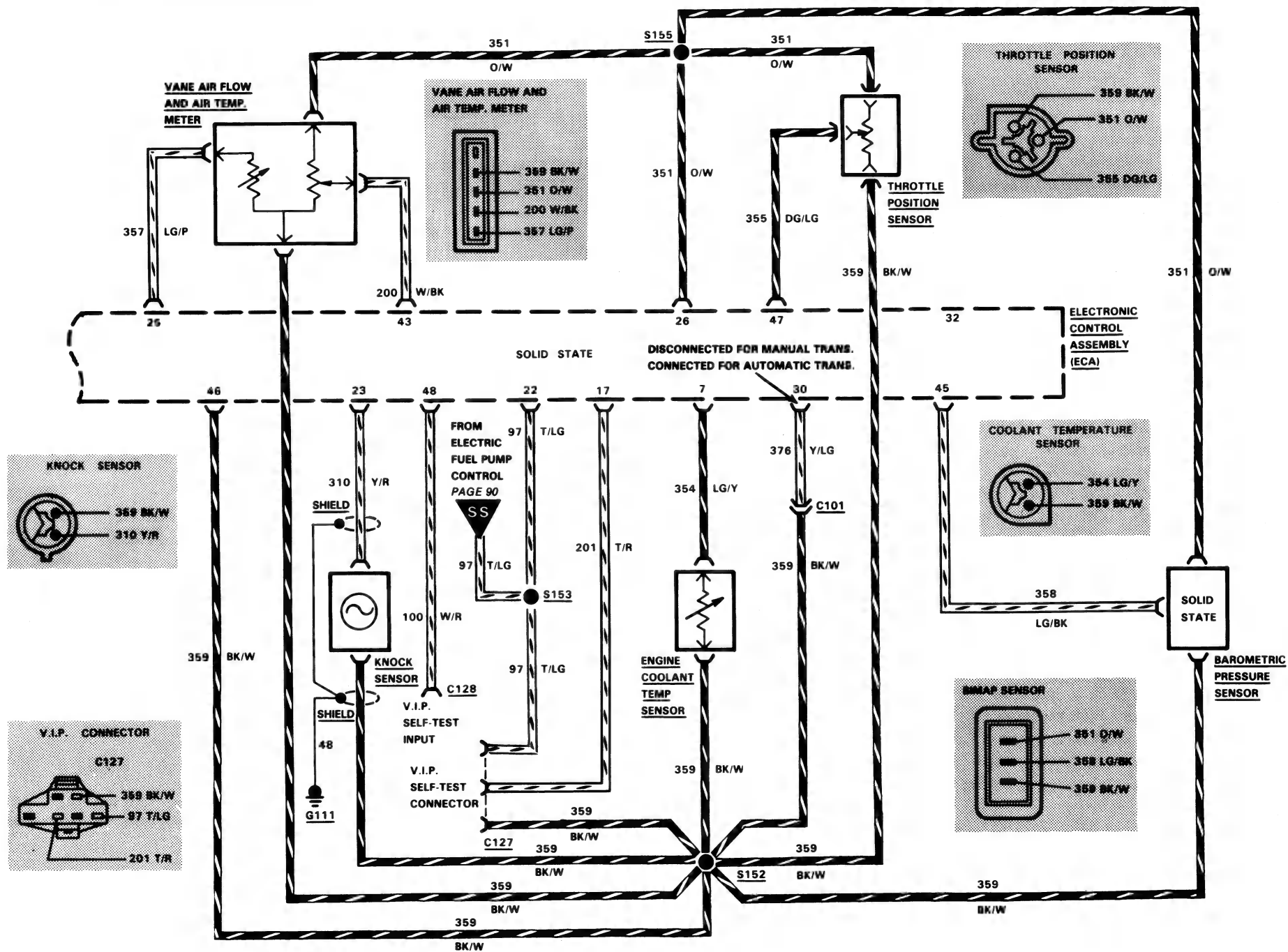


Figure 6—Ignition Switch Connector



28 ELECTRONIC ENGINE CONTROL





HOW THE CIRCUIT WORKS

The **Electronic Engine Control System (EEC IV)** includes an **Electronic Control Assembly (ECA)** that receives inputs from various sensors. The ECA uses this information to provide improved fuel economy and performance, and lower exhaust emissions.

The **EEC SYSTEM** has a special **Distributor** that has no magnetic pickup or advance mechanisms. Instead, all ignition timing is controlled by the **ECA**.

The **ECA** receives engine timing information from the **Distributor** through the **TFI Ignition Module**. The **ECA** uses this information for spark timing and advance.

The 2.3L EFI Turbo engine used on the Merkur uses **EEC IV** Electronic Fuel Injection (EFI). Fuel is injected directly into each cylinder through the **Fuel Injectors**. A carburetor is not used. Fuel pressure is built up by the **Electric Fuel Pumps**. With the **Ignition Switch** in START or RUN, the **EEC Power Relay** applies voltage to the circuit. When controlled by the **Electronic Control Assembly**, and with the **Inertia Switch** closed, the **Fuel Pump Relay** operates, applying power to the **Fuel Pumps** through the **Inertia Switch**.

Current to the **Rear Fuel Pump** passes through the pump and a ballast **Resistance Wire**, connected to ground. This pump, mounted in the fuel tank, pumps fuel at low pressure. Pressure is boosted by the **Front Fuel Pump**.

The **Idle Speed Actuator** controls cold and warm engine idle speed. Also, it adjusts for load when the A/C and power steering operate.

COMPONENT LOCATION

		Page-Figure	Color	Terminals
Barometric Pressure				
Sensor	RH fender apron	33-2		
EEC Power Relay	Attached to lower RH cowl near ECA			
EGR Control Solenoid	LH fender apron	25-3		
EGR Valve Position				
Sensor	At top of RH front of engine			
EGR Vent Solenoid	LH front of engine			
Electronic Control				
Assembly	Attached to lower RH cowl	34-3		
Engine Coolant				
Temperature Sensor	Top front of engine	32-1		
Exhaust Gas Oxygen				
(EGO) Sensor	LH rear of engine	32-1		
Fuel Injectors	Upper LH side of engine	32-1		
Fuse Link A	At starter relay	26-4		
Knock Sensor	Bottom, LH rear of engine	32-1		
Manifold Charge				
Temperature Sensor	RH side of engine on manifold			
TFI Ignition Module	Connected to RH side of distributor	32-1		
Throttle Air Bypass Valve				
Solenoid	LH front fender apron	32-1		
Throttle Position Sensor	LH side of engine	32-1		
Turbo Boost Solenoid	RH side engine at turbocharger	33-2		
Vane Air Flow Meter	RH front of engine	33-2		
Connector C101	Lower RH cowl near ECA	34-4	BK	6
Connector C102	LH fender apron	32-1	BK	4
Connector C105	LH side fender apron	25-3	GY	8
Connector C127	RH fender apron near BMAP T/O	33-2	GY	6
Connector C128	RH fender apron near BMAP T/O	33-2, 55-2	BK	1
Connector C216	RH fender apron			
Connector C220	Center rear of engine compartment			
Ground G111	Lower RH cowl near ECA			
Ground G113	RH side of engine near EGO sensor			

(Continued on next page)

Exhaust Gas Recirculation (EGR)

The **EGR Control Solenoid** sends vacuum to the ported EGR valve, which allows exhaust gases to recirculate. The solenoid operates at a time after the engine starts. With higher coolant temperature at start, the time delay is shorter. It turns off at high temperature, high load (boost) and high engine speed.

Sensing Devices

Various sensing devices are used to determine engine operating conditions. They provide the **ECA** with throttle pressure, temperature, and exhaust gas information.

The **Throttle Position Sensor** sends one of three signals to the **ECA** to indicate closed, partially open, or wide open throttle.

The **Engine Coolant Temperature Sensor** measures engine temperature.

The **Barometric Pressure Sensor** measures atmospheric pressure (changes with altitude).

The **Exhaust Gas Oxygen Sensor** provides a voltage to the **ECA** for regulating the air/fuel ratio by sensing the oxygen content of the exhaust gases. Oxygen shows a lean exhaust gas mixture while no oxygen shows a rich mixture.

The **Vane Air Flow Meter** measures flow rate of inlet air. The **Vane Air Temperature Sensor** measures the temperature of inlet air. The **ECA** uses these signals to calculate mass air flow.

The **Knock Sensor** detects engine knock so that timing can be changed.

COMPONENT LOCATION *(Continued from previous page)*

		Page- Figure	Color	Terminals
Splice S102	Lower RH cowl near ECA			
Splice S111	LH fender apron	32-1		
Splice S112	RH rear of engine compartment			
Splice S144	Center of dash panel	32-1		
Splice S152	Lower RH cowl near ECA			
Splice S153	Lower RH cowl near ECA			
Splice S154	Lower RH cowl near ECA			
Splice S155	RH rear of engine compartment			
Splice S158	Near fuel injectors			
Splice S159	Near fuel injectors			
Splice S160	RH side fender apron near starter relay			

TROUBLESHOOTING HINTS

The **EEC** engine operates with 13°LOS manual transmission, 10°LOS for automatic transmission, with constant spark timing, and **EGR** system does not operate, there is a problem in either the calibration assembly or the **ECA** (LOS mode).

The constant 10° advance is a fail-safe mode which permits the car to be driven in for service when the electronics are not operating correctly. When this happens, it is necessary to go into the full electronics diagnosis routine.

Read the Shop Manual and special service bulletins for complete **EEC** test procedures using special Rotunda test equipment.

NOTE

If engine does not operate after a collision, it is possible the Inertia Switch has opened. Switch can be reset by pushing down on plunger of switch.

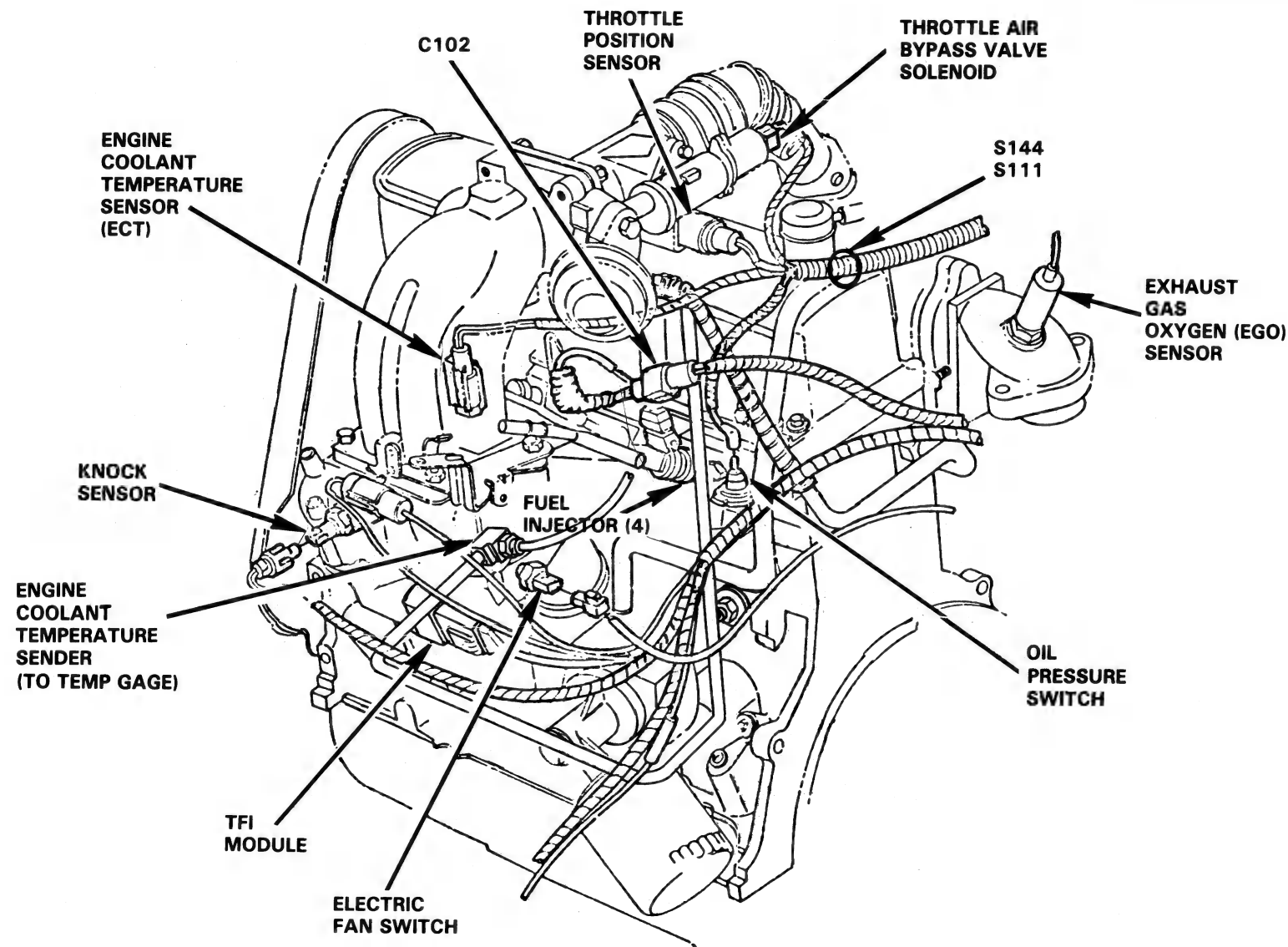


Figure 1—Engine Wiring, LH Side

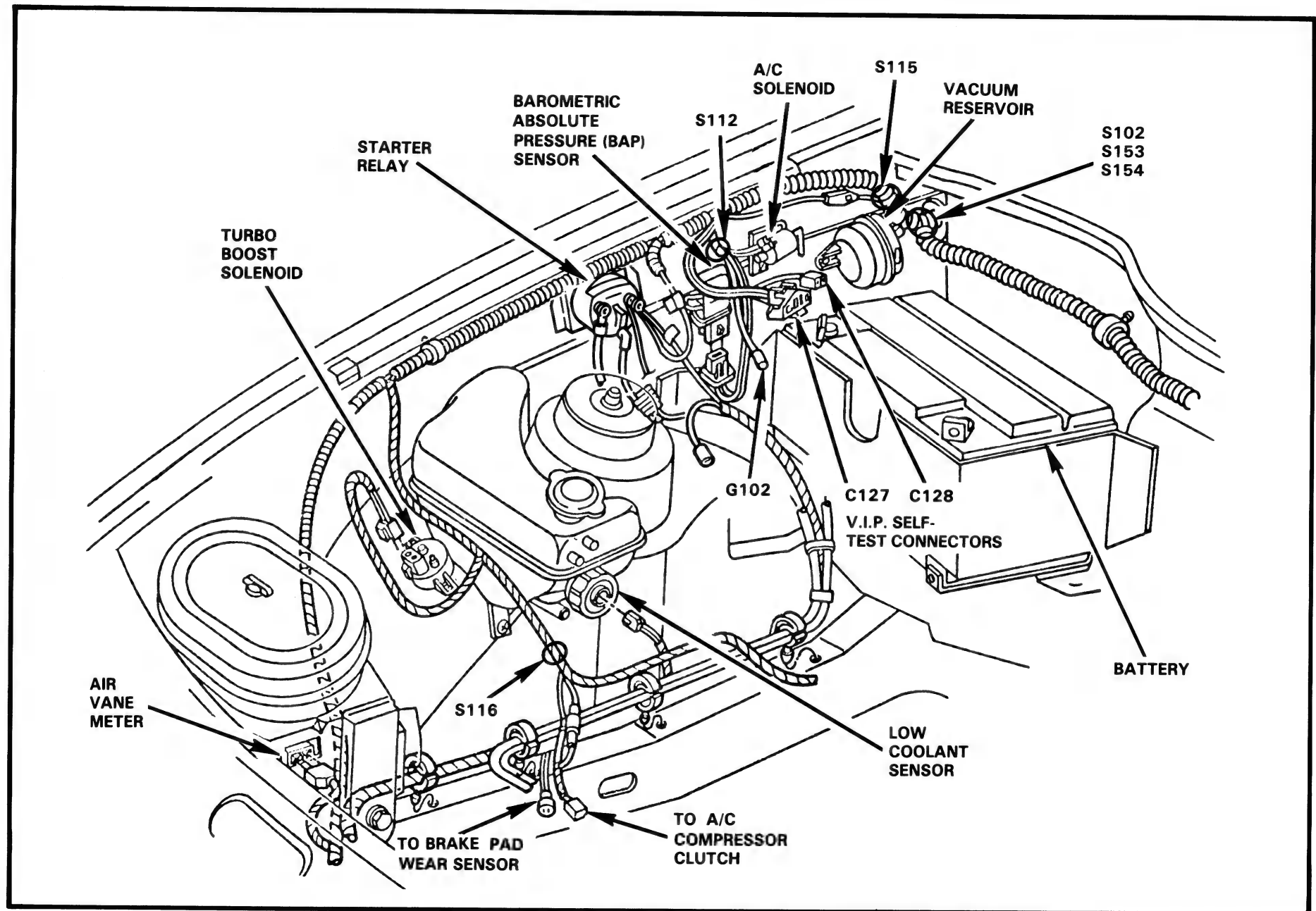


Figure 2 — RH Fender Apron Wiring

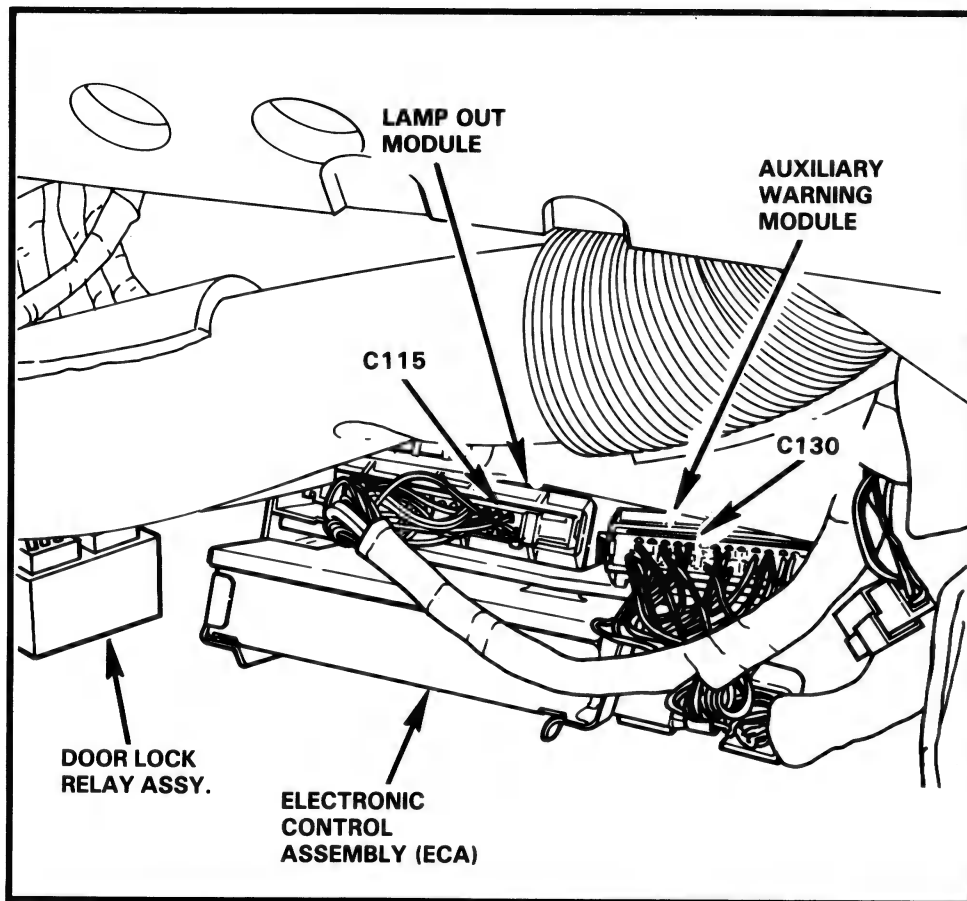


Figure 3—Electronic Control Assembly

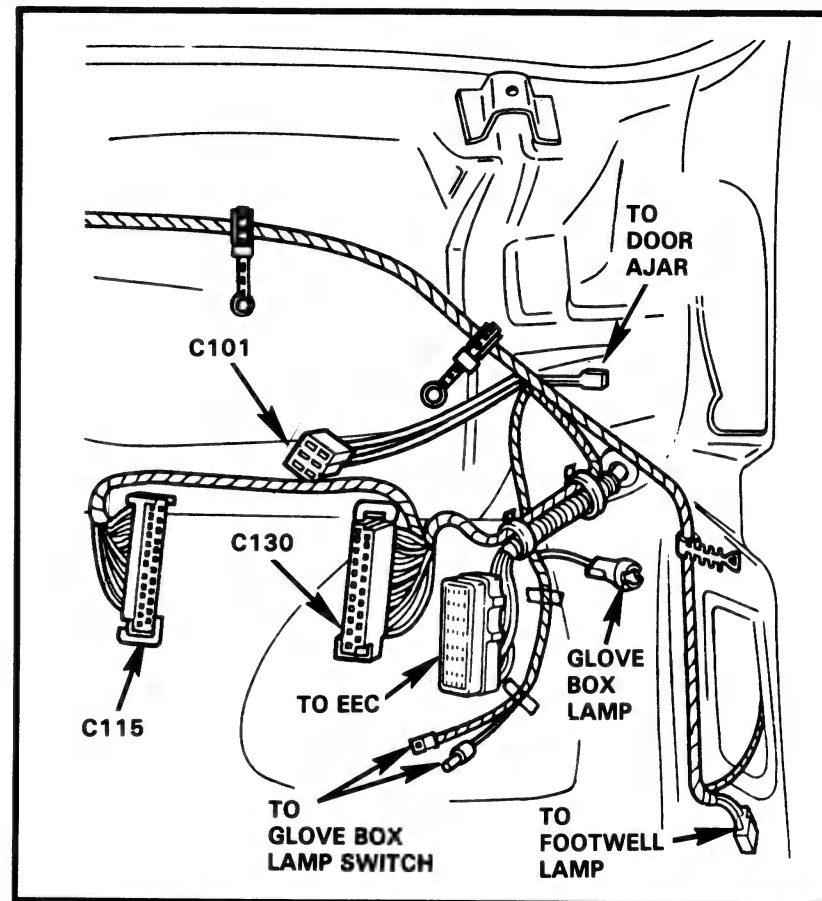
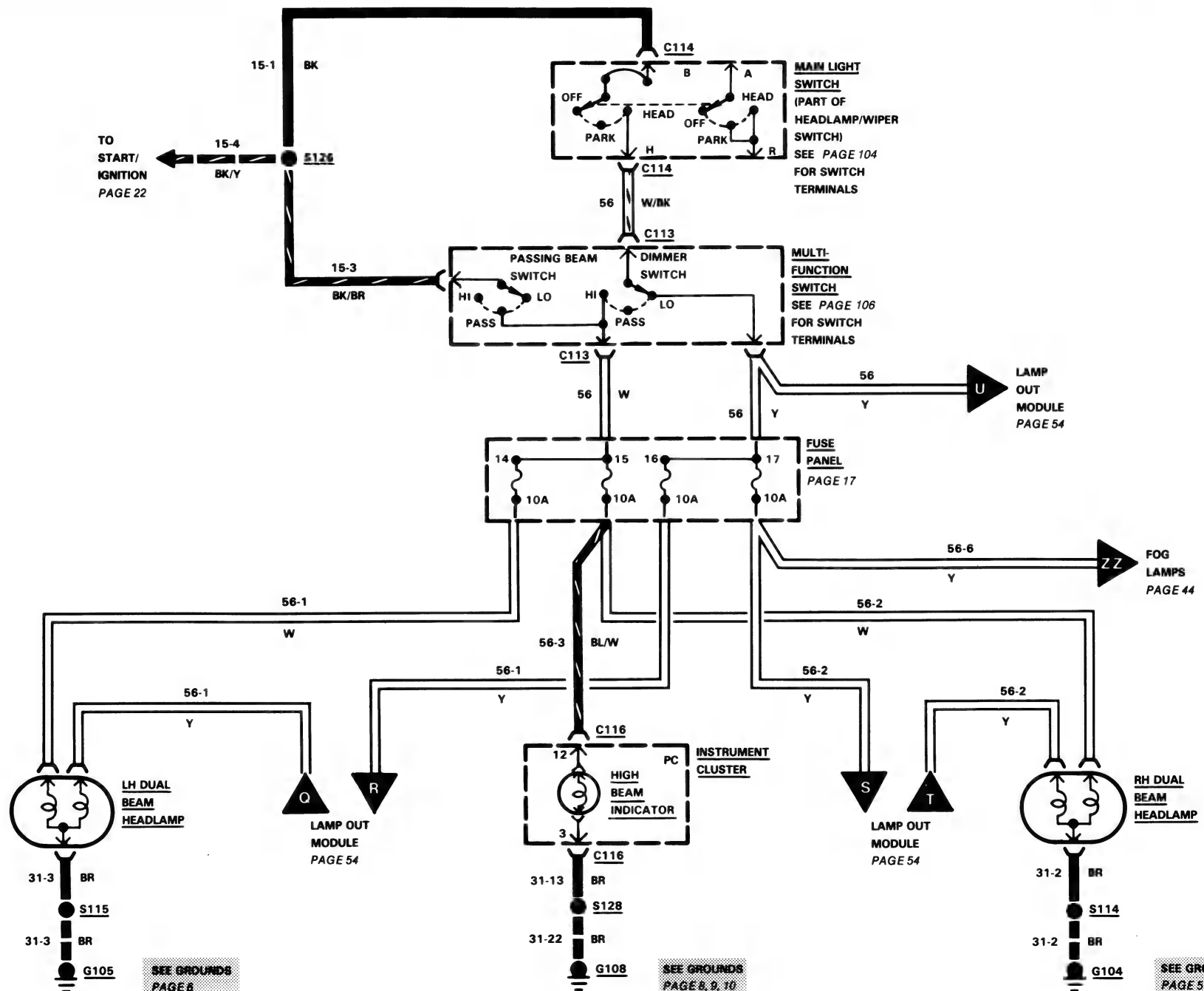


Figure 4—RH Cowl Wiring



HOW THE CIRCUIT WORKS

Power to operate the **Headlamps** normally flows through the **Main Light Switch**, the lever on the RH side of steering column; and the **Dimmer Switch**, the lever on the LH side of steering column, providing power to Fuses 16 and 17. Current then flows through the outage module, which monitors **LO** beam lamp operation only, and then to the **LO** beam lamps. When the **Dimmer Switch** is pulled towards the driver, the passing beam switch closes, providing power to Fuses 14 and 15. Current then flows to the **HI** beam lamps.

TROUBLESHOOTING HINTS

NO HEADLAMPS (HI AND/OR LO)

- Check Fuses 14, 15, 16 and 17.

NO HEADLAMPS: PASSING BEAM OK

- Check for voltage at **W/BK** wire of **Multi-Function Switch**. If bad, check continuity of wire and **Main Light Switch**.
- Check continuity of dimmer switch. Replace if bad.

HEADLAMPS OK; NO PASSING BEAM

- Check for voltage at **BK/BR** wire of **Multi-Function Switch**.

COMPONENT LOCATION

		Page- Figure	Color	Terminals
Main Light Switch	On RH side of steering column	36-1		
Multi-Function Switch	On LH side of steering column	40-2		
Connector C113	LH side steering column	13-3	BK	4
Connector C114	RH side steering column	36-1	BK	8
Connector C116	At instrument cluster	46-2	BK	13
Ground G104	RH side engine compartment, near parking lamp	21-1		
Ground G105	Near LH flasher T/O	12-1		
Ground G108	LH cowl panel	13-3		
Splice S114	RH side of engine compartment near horn T/O			
Splice S115	LH side of engine compartment near horn T/O			
Splice S126	Near ignition switch T/O	78-1		
Splice S128	Near LH door ajar switch T/O	78-1		

- Check continuity of passing beam switch.

NO HI AND LOW BEAM ON ONE SIDE

- Make sure ground connection on that side is clean and tight.

ONE HEADLAMP DOES NOT WORK

- Check bulb.
- Check for frayed or damaged wires, or loose connections.

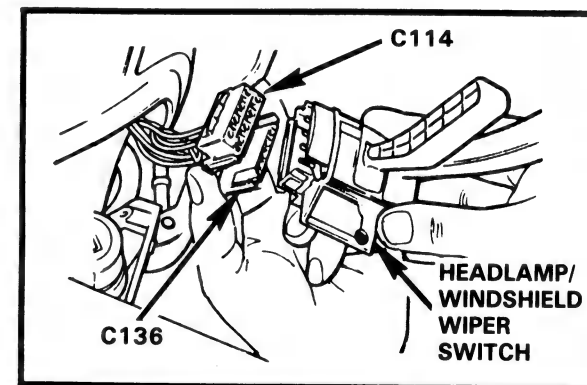
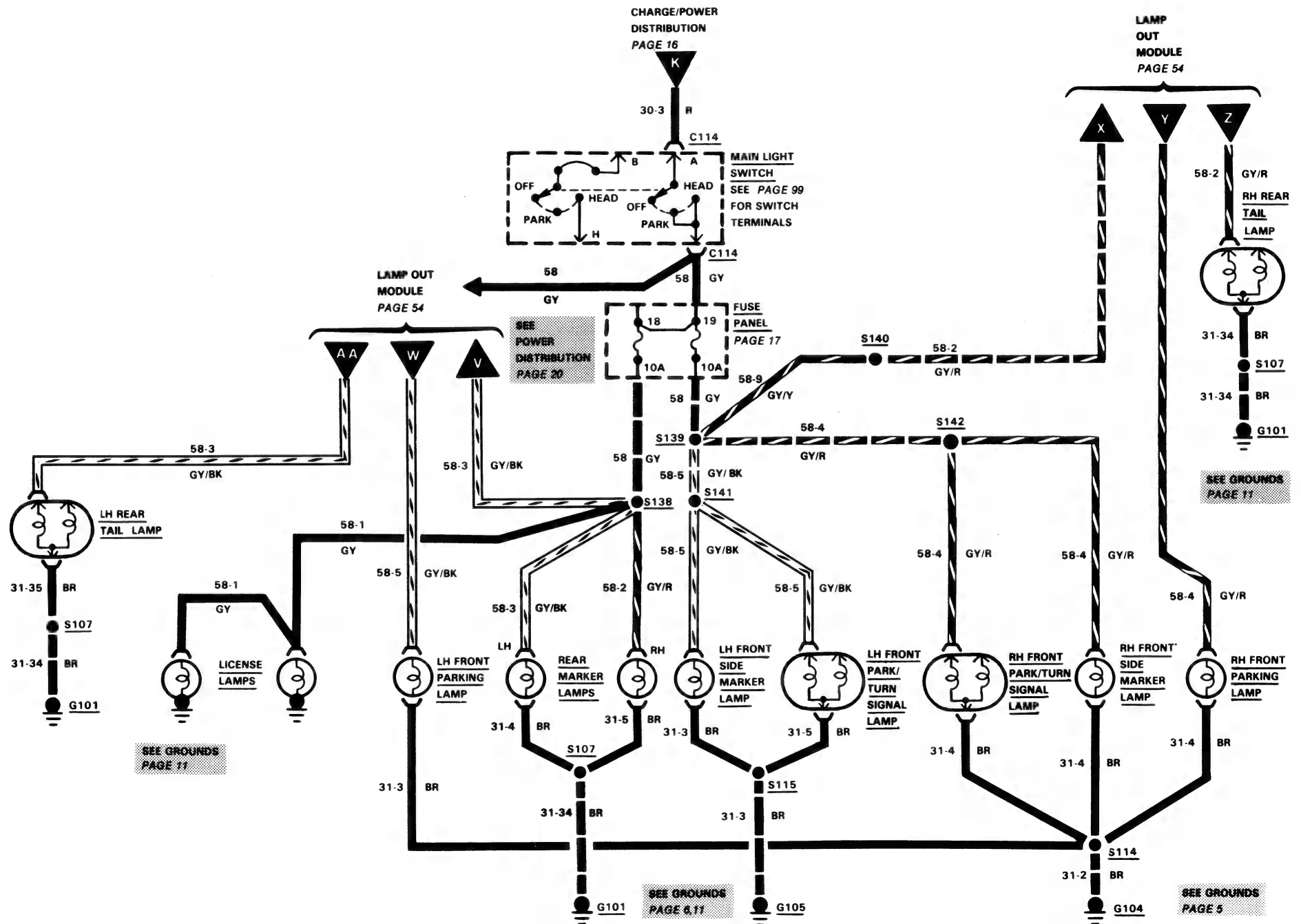


Figure 1 — Headlamp/Wiper Switch



38 EXTERIOR LAMPS (PARK, MARKER, LICENSE)

HOW CIRCUIT WORKS

Power is supplied to the **Main Light Switch** from **Fuse Link B**. Current then flows through Fuses 18 and 19 to the marker, parking and license lamps.

TROUBLESHOOTING HINTS

NO EXTERIOR LAMPS WORK

- Look for frayed or damaged wires, or loose connections.
- Make sure **C114** and connector at **Bulb Outage Module** are tight.
- Check for voltage at **R** wire of **Main Light Switch**. If bad, check harness back to **Battery**.

ONE LAMP DOES NOT WORK

- Check bulb.
- Check for frayed or damaged wires, or loose connections.

RH LAMPS DO NOT WORK

- Check **Fuse 19**

LH LAMPS OR LICENSE LAMPS DO NOT WORK

- Check **Fuse 18**

COMPONENT LOCATION

		Page-Figure	Color	Terminals
Main Light Switch	RH side steering column	36-1		
Connector C114	RH side steering column	36-1	BK	8
Ground G101	Near license lamps			
Ground G104	RH side engine compartment, near parking lamp	21-1		
Ground G105	Near LH flasher T/O	12-1		
Splice S107	LH rear panel near tail lamp			
Splice S114	RH side of engine compartment near horn T/O			
Splice S115	LH side of engine compartment near horn T/O			
Splice S138	Near LH door ajar switch T/O behind I/P			
Splice S139	Behind LH side of I/P	78-1		
Splice S141	Below windshield washer bottle	25-3		
Splice S142	Near RH side of condenser fan	21-1		

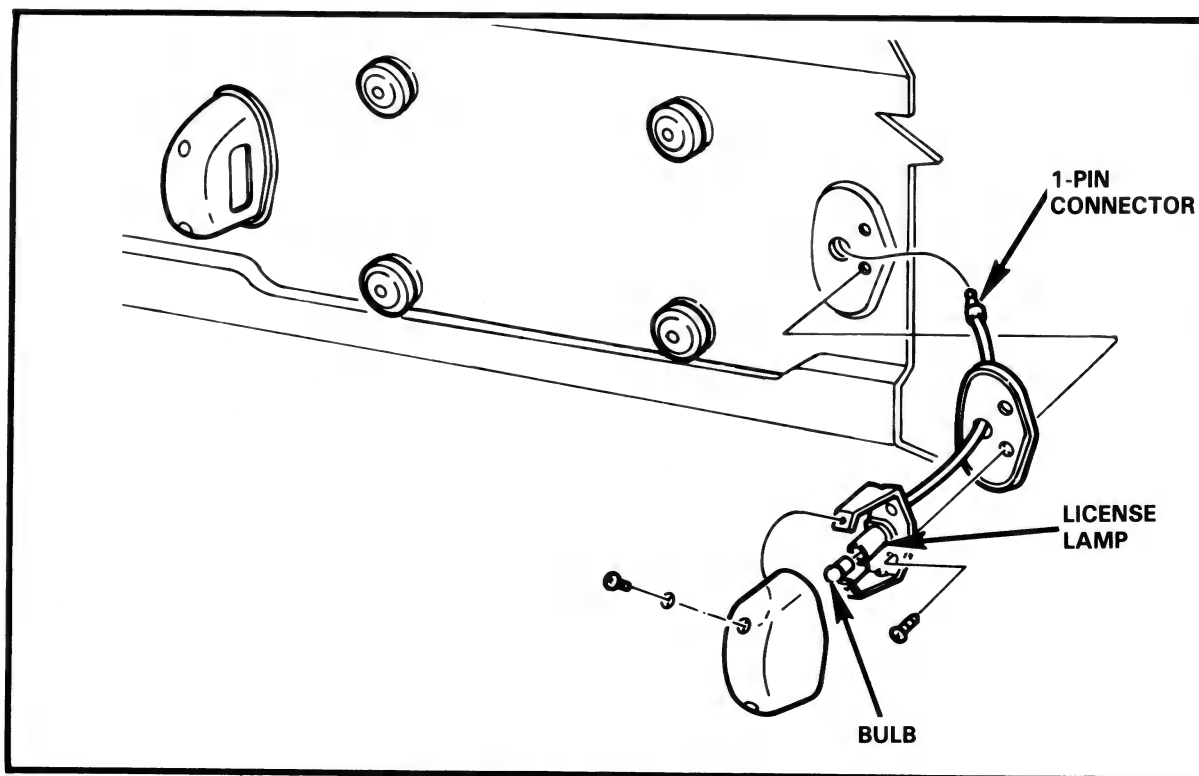
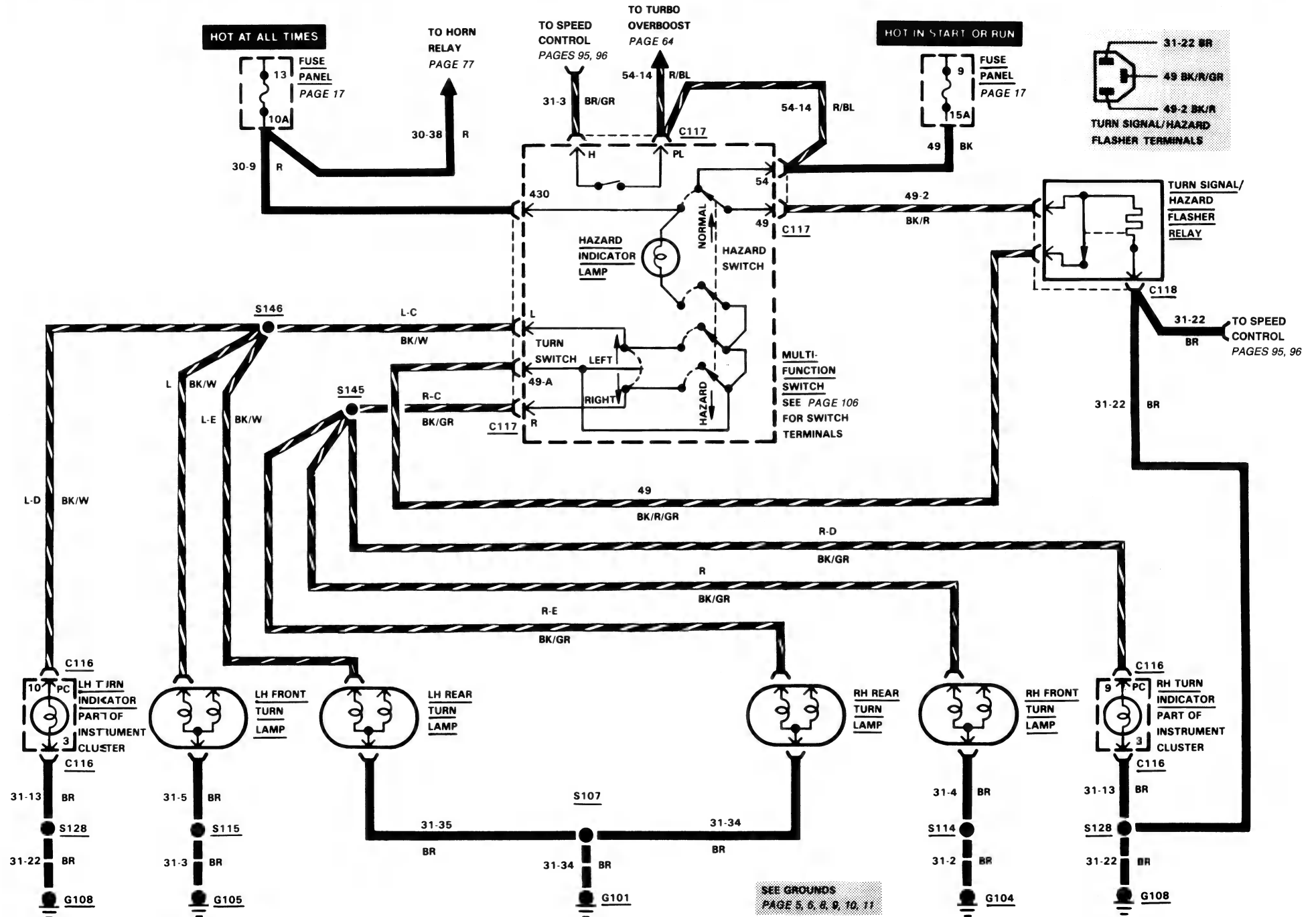


Figure 1 — License Lamps



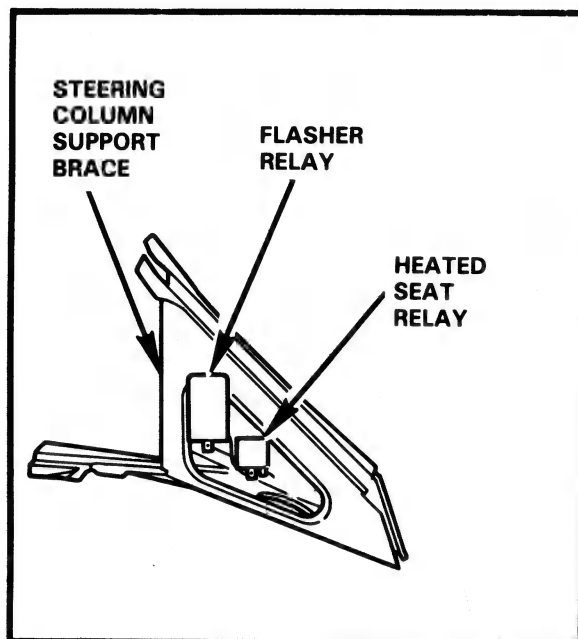


Figure 1—Steering Column—Relay Locations

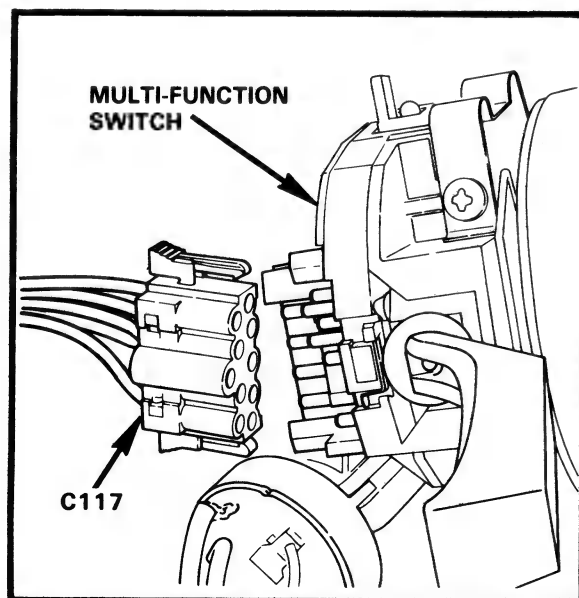


Figure 2—Multi-Function Switch

COMPONENT LOCATION

		Page-Figure	Color	Terminals
Multi-Function Switch	LH side and top of steering column	40-2		
Turn Signal/Hazard Flasher	Behind LH side of I/P			
Connector C116	At instrument cluster	13-3	BK	13
Connector C117	At turn signal stalk switch	40-2	BK	10
Connector C118	At turn signal/hazard flasher relay	13-3	BK	3
Ground G101	Near license lamps			
Ground G104	RH side engine compartment, near parking lamp	21-1		
Ground G105	Near LH flasher T/O	12-1		
Ground G108	LH side of I/P near foglamp switch T/O			
Splice S107	LH rear panel, near tail lamp			
Splice S114	RH side of engine compartment near horn T/O			
Splice S115	LH side of engine compartment near horn T/O			
Splice S128	Near LH door ajar switch T/O	78-1		
Splice S145	Behind LH side of I/P	78-1		
Splice S146	Behind LH side of I/P	78-1		

HOW THE CIRCUIT WORKS

Turn Signals

With the Ignition Switch in RUN and START, current can flow through Fuse 9, Multi-Function Switch, the Turn Signal/Hazard Flasher and on to the Turn Lamps and indicators.

The turn switch sends the power to either the LH or RH Turn Lamps.

Hazard Flasher

Current flows through Fuse 13 to the Turn Lamps and Hazard and Turn Signal indicators when the hazard switch located on top of the steering column is pushed in.

The hazard switch sends current to both the RH and LH Turn Lamps at the same time.

TROUBLESHOOTING HINTS

HAZARD FLASHER DOESN'T WORK

- Check Fuse 13 by operating Horn.
- Check voltage at C117 BK/R wire at Multi-Function Switch.

- Replace Multi-Function Switch.
- Check if Turn Signals are flashing ON and OFF. If not, replace Turn Signal/Hazard Flasher.

TURN INDICATORS DON'T WORK

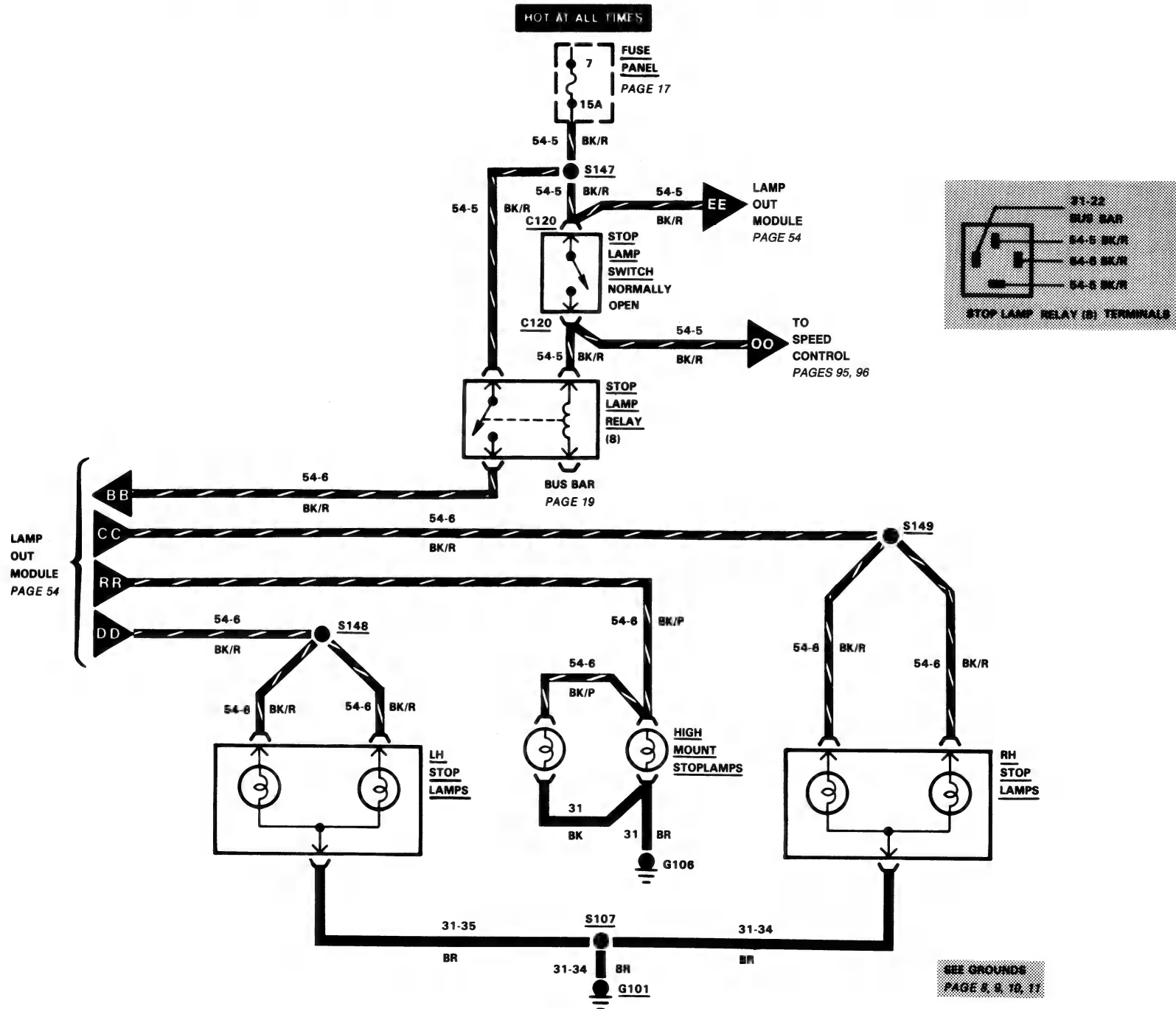
- Check Fuse 9.
- Check voltage at BK/R wire at Multi-Function Switch wire.
- Replace Multi-Function Switch
- Check if Hazards are working properly. If not, replace Turn Signal/Hazard Flasher.

NO FRONT OR REAR LAMPS

- Check ground points are tight and not corroded.

ONE TURN LAMP NOT OPERATING

- Check for burned-out bulb.
- Check voltage and ground at bulb socket.
- Check for frayed and damaged wires.
- Check that connectors are not corroded.



42 STOP LAMPS

HOW THE CIRCUIT WORKS

Current flows through **Fuse 7** to the **Stoplamp Switch** and **Relay**. When the **Stoplamp Switch** is closed, the **Stoplamp Relay** is energized and current flows through the **Lamp Out Module** and then to the **Stoplamps**.

TROUBLESHOOTING HINTS

BOTH STOPLAMPS DON'T WORK

- Check **Fuse 7**.
- With **Stoplamp** switch closed, check voltage at **C119 BR** wire.
- Check **G108** for tight connection.

ONE STOPLAMP DOES NOT WORK

- Check bulb.
- Check for frayed or damaged wires, or loose connections.

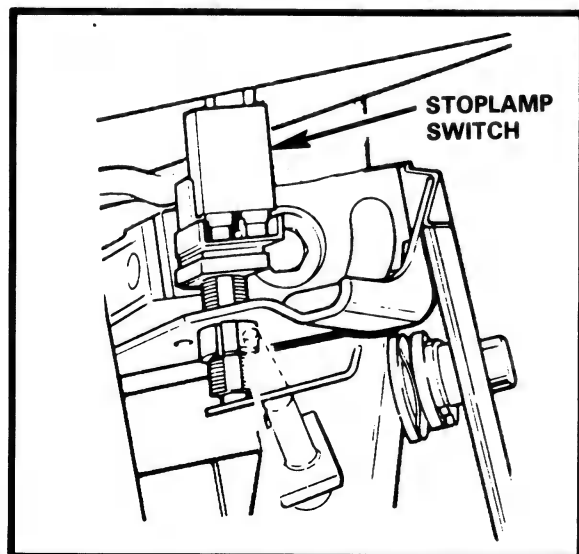


Figure 1 — Stoplamp Switch

COMPONENT LOCATION

		Page-Figure	Color	Terminals
Stoplamp Relay	In relay/fuse panel RLY VIII			
Stoplamp Switch	Attached to brake pedal arm	42-1		
Connector C120	At stoplamp switch	13-3	BK	2
Ground G101	Near license lamps			
Splice S107	LH rear panel, near tail lamp			
Splice S147	Near stoplamp switch T/O			
Splice S148	Near LH tail lamp	42-2		
Splice S149	Near RH tail lamp	42-2		

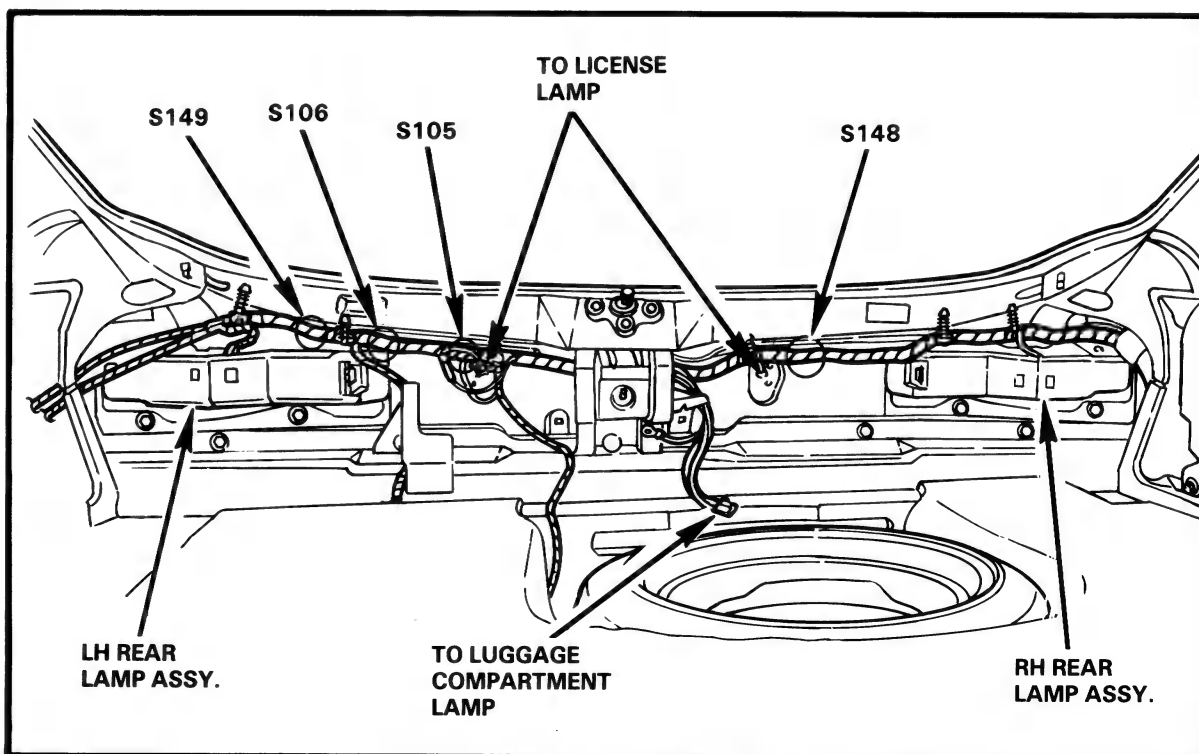
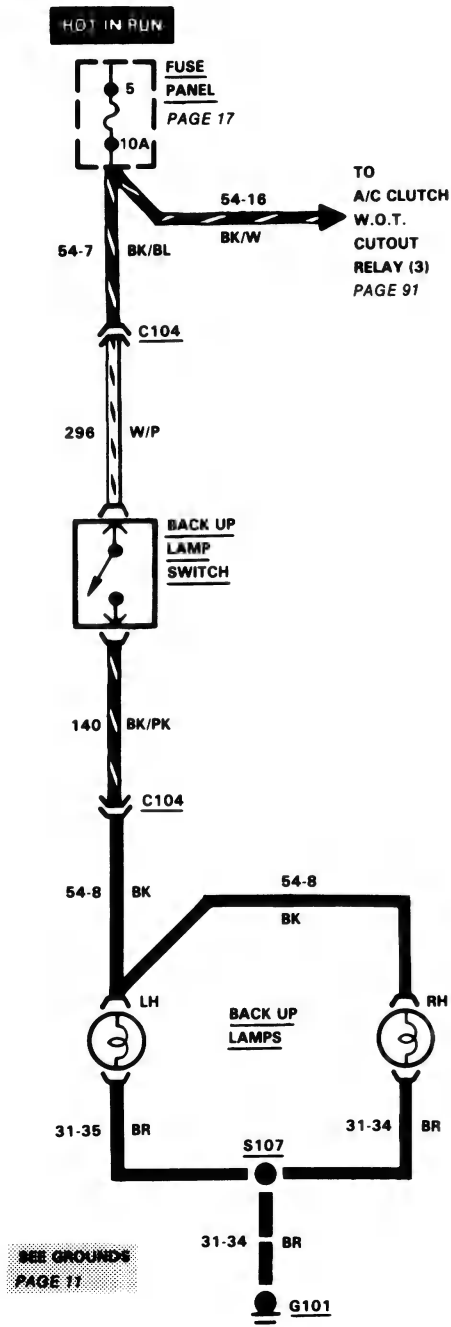


Figure 2 — Rear Lamp Wiring



COMPONENT LOCATION

		Page- Figure	Color	Terminals
Backup Lamp Switch	Part of transmission assembly	43-1		
Connector C104	Beneath center of vehicle, near transmission	43-1		4
Ground G101	Near license lamps			
Splice S107	LH rear panel, near tail lamp			

HOW THE CIRCUIT WORKS

Current flows through Fuse 5 to the Backup Lamp Switch and then to the Backup Lamps.

TROUBLESHOOTING HINTS

NO BACKUP LAMPS WORK

- Check Fuse 5.
- Separate C104. With Ignition Switch in RUN and engine off, put gearshift in REVERSE. Check continuity of the Backup Switch between W/P and BK/PK wires.

ONE BACKUP LAMP WILL NOT WORK

- Check bulb.
- Check bulb socket for corrosion.
- Check voltage at bulb socket.
- Check continuity to ground.

BACKUP LAMPS STAY ON

- Check Backup Switch. (Section 32-20 of Shop Manual.)

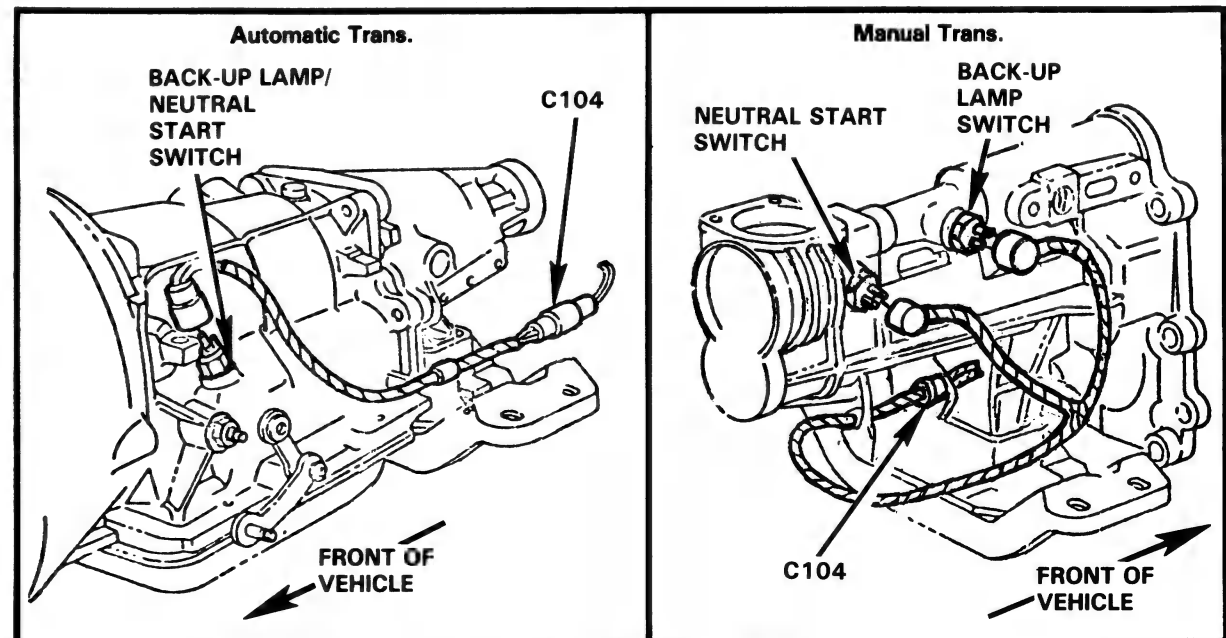
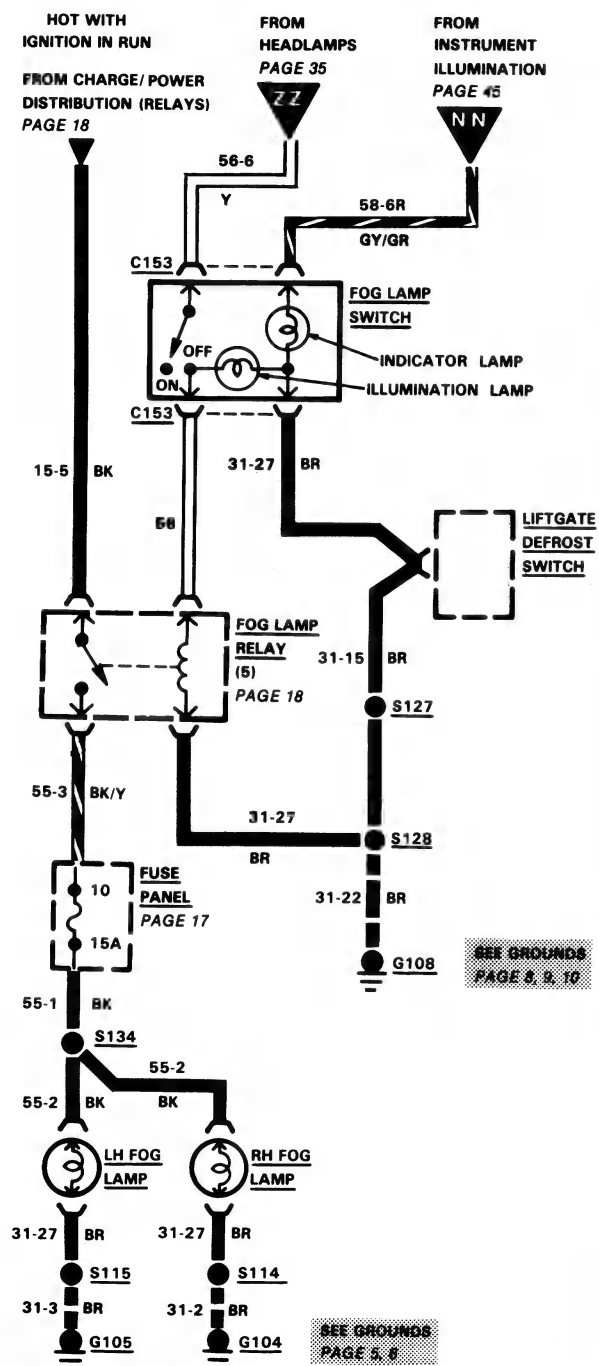


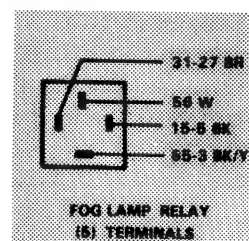
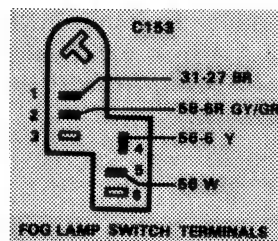
Figure 1 – Back-Up Lamp/Neutral Start Switch

44 FOG LAMPS



COMPONENT LOCATION

		Page-Figure	Color	Terminals
Fog Lamp Relay	At fuse panel			
Fog Lamp Switch	LH side of I/P	63-1		
Connector C153	At fog lamp switch	13-3		
Ground G104	RH side engine compartment near parking lamp			6
Ground G105	Near LH flasher T/O	12-1		
Ground G108	LH cowl panel	13-3		
Splice S114	RH side of engine compartment near horn T/O			
Splice S115	LH side of engine compartment near horn T/O			
Splice S128	Near LH door ajar switch T/O behind I/P			
Splice S134	Near LH fog lamp			



HOW THE CIRCUIT WORKS

Current flows from Ignition Relay (10) through Fog Lamp Relay, and Fuse 10 to Fog Lamps. Fog Lamp Relay is controlled by Low-beam Headlamp voltage which provides operation of Fog Lamps only with Low-beam Headlamp operation.

TROUBLESHOOTING HINTS

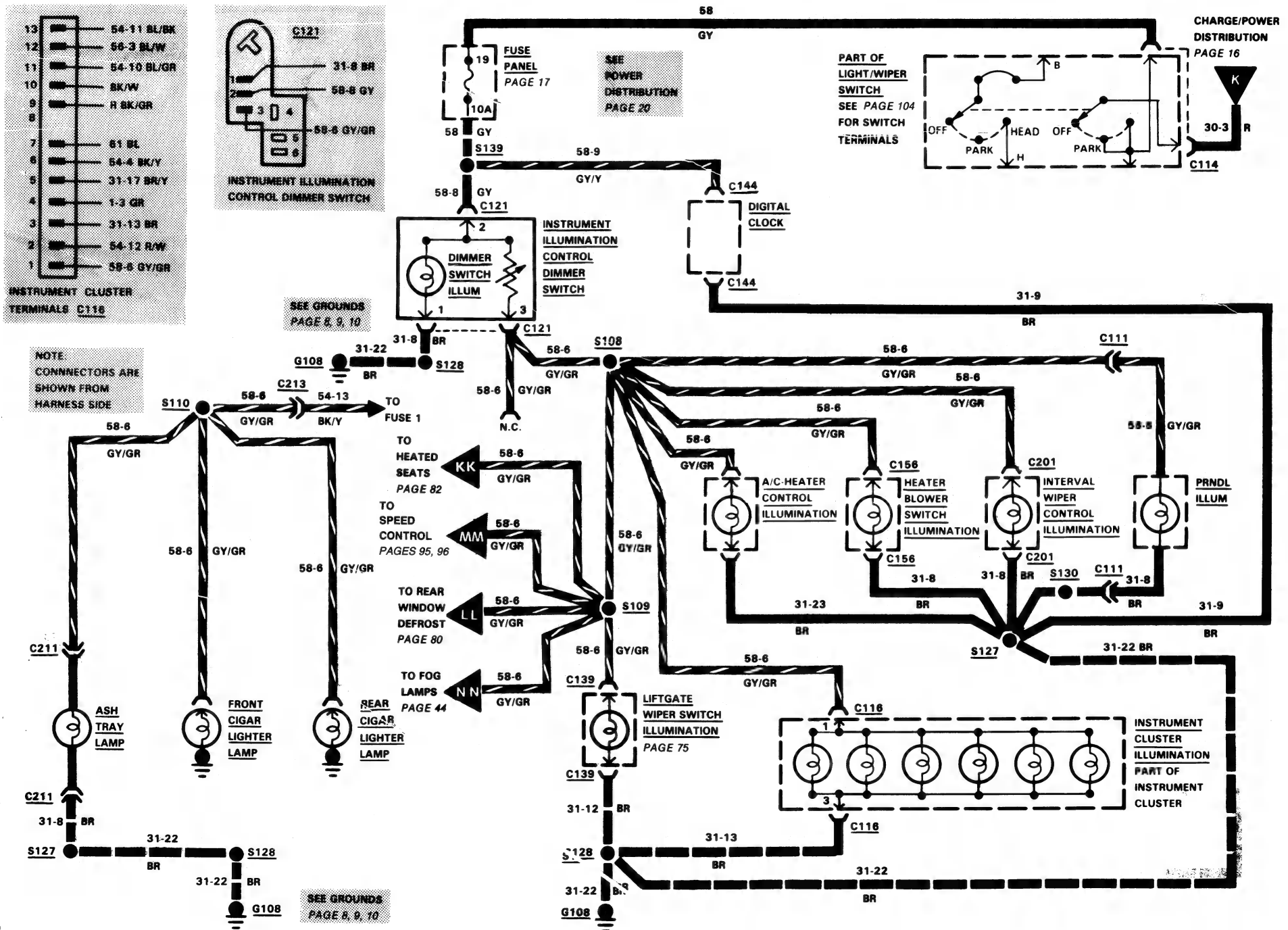
NO FOG LAMPS WORK

- Check **Fuse 10**—fuse not open, voltage at 55-1.
- Check that **Headlamp Switch** is in low-beam position.
- Check **Fog Lamp Switch**—indicator lamp "on."

- Check **Fog Lamp Relay**—voltage at coil (56), continuity through relay coil, continuity to ground (31-27), voltage at contacts, in at 15-5, out at 55-3. If coil is open or no voltage out (55-3) with voltage in, replace relay.

ONE FOG LAMP DOES NOT WORK

- Check bulb.
- Check voltage at 55-2.
- Check continuity to ground 31-27.
- Check for open/broken wire between bulb socket splice S134, S114 or S115.



46 INSTRUMENT AND SWITCH ILLUMINATION

HOW THE CIRCUIT WORKS

With either the parking lamps or headlamps ON, current flows through the **Main Light Switch**, powering **Fuse 9**. Current then flows through the **Instrument Illumination Control Dimmer Switch**, illuminating the affected components or switches.

TROUBLESHOOTING HINTS

NO INSTRUMENT LAMPS WORK

- Check **Fuse 19**.
- Check for loose or corroded connections.
- Disconnect **C121** and check resistance of dimmer switch.

ONE LAMP NOT WORKING

- Check bulb and socket.
- Check continuity to ground.

COMPONENT LOCATION

		Page-Figure	Color	Terminals
Instrument Illumination Control Dimmer Switch	Beneath the speedometer	46-1		
Main Light Switch	RH side of steering column	36-1		
Connector C111	Beneath console	84-1		
Connector C114	RH side of steering column	36-1	BK	8
Connector C116	At instrument cluster	46-2	BK	13
Connector C121	At illumination dimmer switch	46-1	Y	6
Connector C139	At rear wiper switch	13-3	P	6
Connector C144	At digital clock	55-2	BK	4
Connector C156	At heater blower switch	55-2	BK	8
Connector C201	At interval wiper control switch	55-2, 74-1	GY	6
Connector C211	At ashtray illumination	55-2	W	2
Connector C213	Behind center of I/P			1
Ground G108	LH cowl panel	13-3	BK	1
Splice S108	Near illumination dimmer switch T/O			
Splice S109	Near illumination dimmer switch T/O	78-1		
Splice S110	Near illumination dimmer switch T/O	78-1		
Splice S127	Behind center of I/P	78-1		
Splice S128	Near LH door switch T/O behind I/P	78-1		
Splice S139	Near rear wiper switch T/O	78-1		

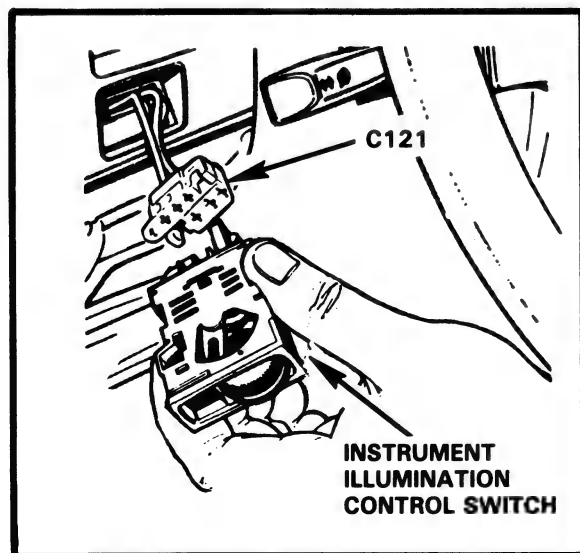


Figure 1 — Illumination Control Dimmer Switch

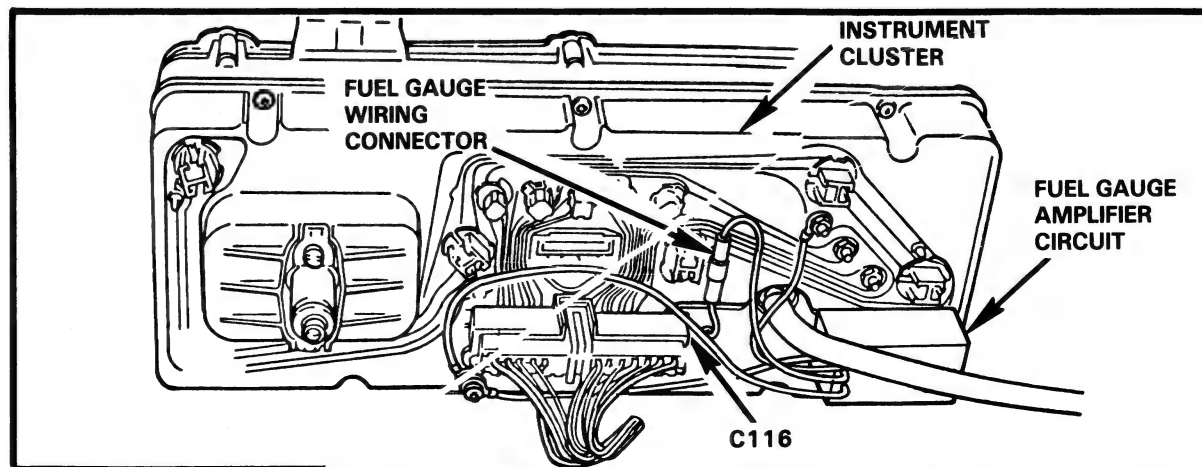
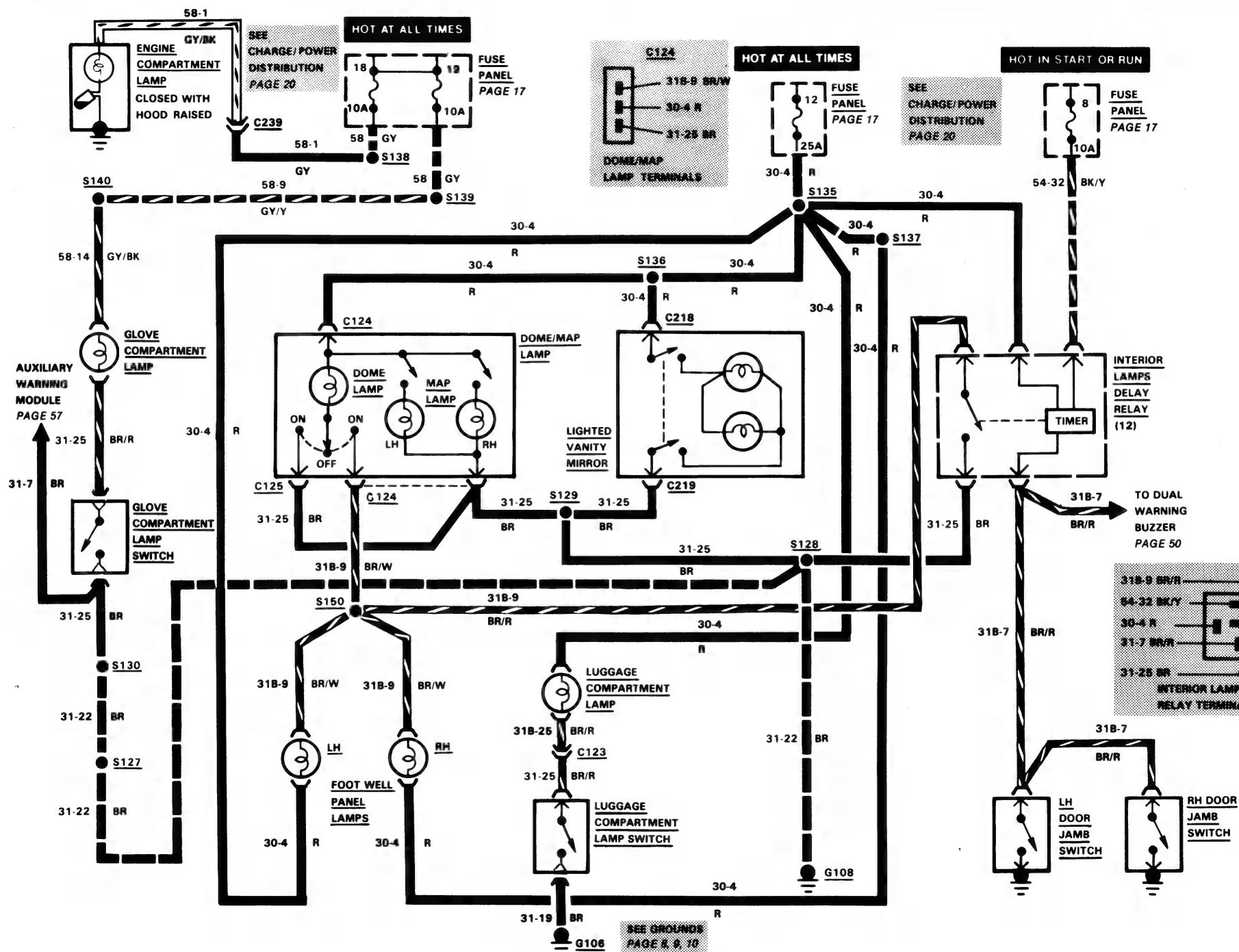


Figure 2 — Instrument Cluster



HOW THE CIRCUIT WORKS

COURTESY LAMPS

Voltage is applied at all times through **Fuse 12** to this circuit. The **Dome** and **Cowl Panel Lamps** are grounded through the **Interior Lamps Delay Relay**. This relay continues courtesy lamp operation (for a set time), after the door has been closed.

UNDERHOOD LAMP

Voltage is applied when the park lights or headlamps are turned on through **Fuse 18** to the **Engine Compartment Lamp**. The lamp incorporates a mercury switch which closes when the hood is opened. When the hood is closed, the switch remains open. The lamp is grounded to the hood through the lamp mounting screw.

TROUBLESHOOTING HINTS

NONE OF THE LAMPS WORK

- Check **Fuse 12**.

COWL PANEL LAMPS DON'T WORK

- Check for voltage at **C112 BR** with door open.
- Replace **Interior Lamps Delay Relay**.

COMPONENT LOCATION

	Page-Figure	Color	Terminals
Dome/Map Lamp	At front center of roof		
Door Jamb Switches	In respective door jambs		
Engine Compartment Lamp	Attached to top of hood		
Interior Lamps Delay Relay	In fuse box		
Luggage Compartment			
Lamp Switch	In rear roof trim panel		
Connector C123	In liftgate, just right of latch	GY	2
Connector C124	At dome/map lamp	BK	3
Connector C125	At dome/map lamp	BK	1
Connector C218	At vanity mirror		1
Connector C219	At vanity mirror		1
Connector C239	Near starter relay	BK	1
Splice S127	Behind center of I/P		
Splice S128	Near LH door ajar switch T/O behind I/P		
Splice S129	Near dome/map lamp T/O		
Splice S130	Behind RH side of I/P		
Splice S135	Near LH door ajar switch T/O behind I/P		
Splice S136	Near dome/map lamp		
Splice S137	Behind center of I/P		
Splice S138	Near liftgate wiper switch T/O		
Splice S139	Near liftgate wiper switch T/O		
Splice S140	Near heated seat T/O		
Splice S150	Behind LH quarter panel, rear door post		
Ground G106	In liftgate near latch		
Ground G108	LH cowl panel		

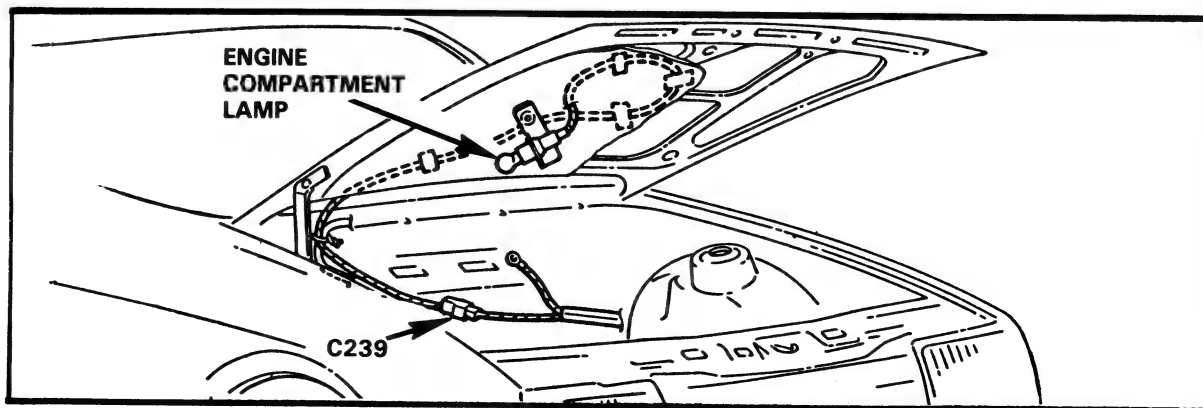


Figure 1 — Engine Compartment Lamp

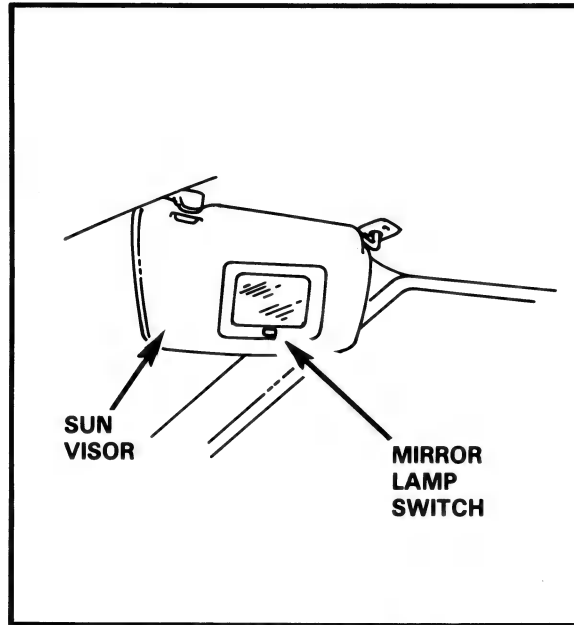


Figure 2—Lighted Vanity Mirror

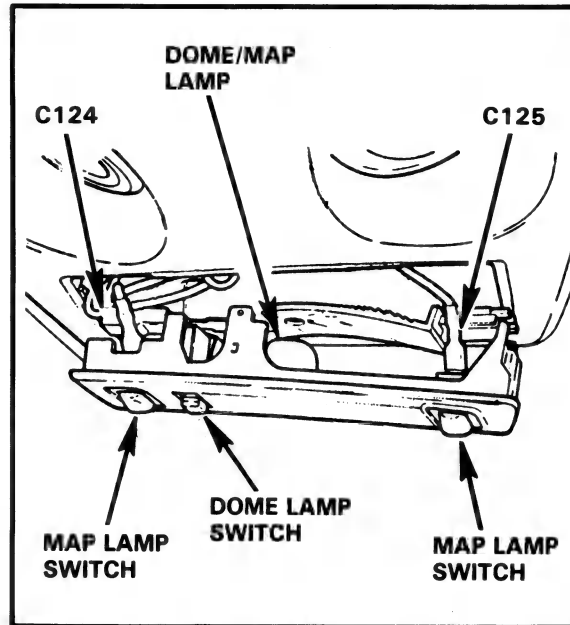


Figure 3—Dome and Map Lamp Switches

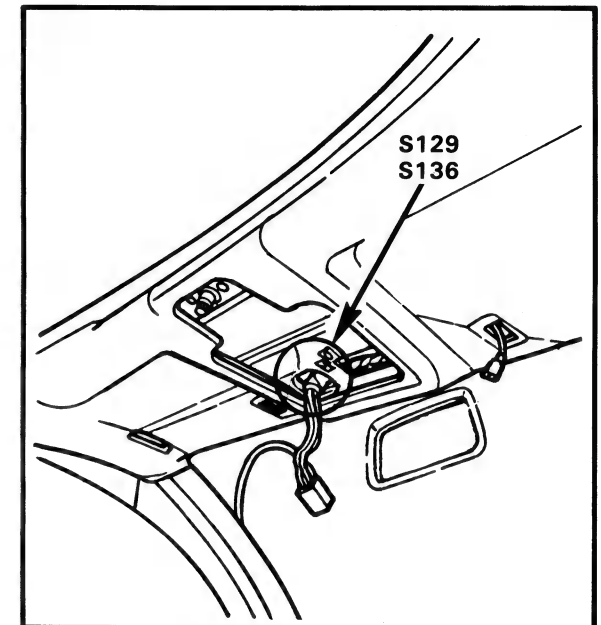
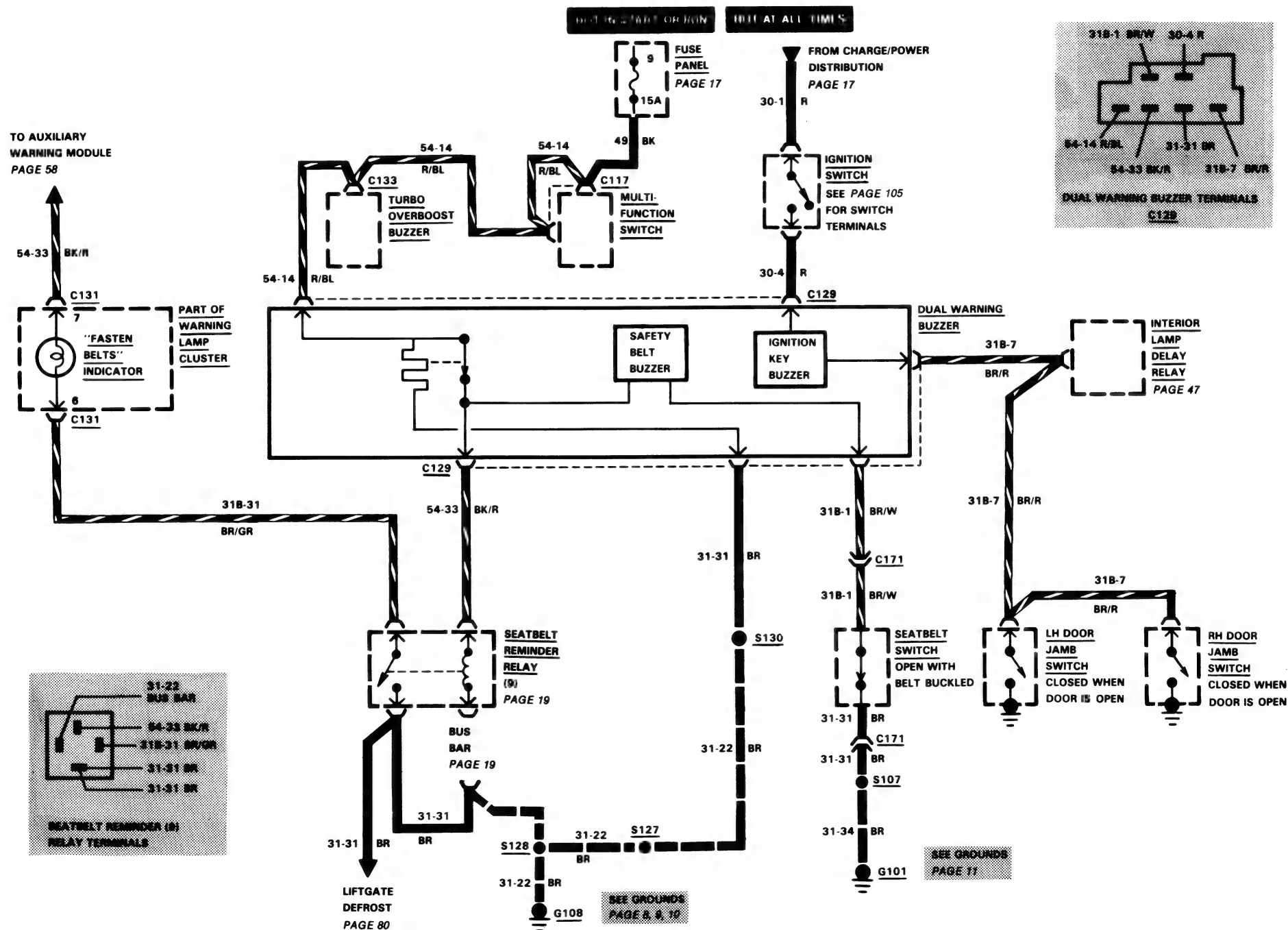


Figure 4—Dome Lamp

NOT TO BE USED OR REIN HOLD AT ALL TIMES



SEATBELT WARNING

HOW THE CIRCUIT WORKS

With the **Ignition Switch** in RUN, current flows through **Fuse 9** and the “**Fasten Belts**” **Indicator** for 4 to 8 seconds, whether belts are buckled or not. The buzzer will sound during this time only if the driver’s belt is not buckled.

A thermal time switch in the **Seatbelt Timer/Buzzer** assembly controls both the indicator and buzzer.

TROUBLESHOOTING HINTS

NO SEATBELT WARNING OPERATION

- Check **Fuse 9** by operating **Turn Signal Indicator**, with **Ignition Switch** on.
- Check for voltage at **R/BL** wire of buzzer.

INDICATOR DOESN'T GO ON

- Check indicator bulb in **Warning Lamp Cluster**.
- Check for voltage at **BK/R** and **BR/GR** wire of **Seatbelt Warning Lamp Relay** when buzzer is on.
- Check continuity from **BR** wire of **Seatbelt Warning Lamp Relay G108**.
- Check for voltage at **BK/R** of **Warning Lamp Cluster**.
- Remove and check timer/buzzer.

BUZZER DOES NOT SOUND

- Check for continuity from **BR** wire or buzzer to **G108**.
- Check for voltage on **R/BL** wire at timer/buzzer.
- Remove and check timer/buzzer.

COMPONENT LOCATION

		Page-Figure	Color	Terminals
Warning Lamp Cluster	Center of I/P			
Door Jamb Switches	In respective door jambs			
Dual Warning Buzzer	Behind RH side I/P			
Ignition Switch	Top RH side of steering column			
Seatbelt Warning Lamp Relay	In fuse panel			
Connector C117	At turn signal stalk switch	13-3,40-2	BK	10
Connector C129	At dual warning buzzer		GY	7
Connector C131	At auxiliary warning lamp indicator		BK	7
Connector C133	At turbo overboost buzzer	55-2	BK	3
Connector C171	At seat belt switch	26-6	GY	2
Ground G101	Near license lamps			
Ground G108	LH cowl panel	13-3		
Splice S107	LH rear panel, near tail lamp			
Splice S127	Behind center of I/P	78-1		
Splice S128	Near LH door ajar switch T/O behind I/P	78-1		
Splice S130	Behind RH side of I/P	78-1		

KEY WARNING

HOW THE CIRCUIT WORKS

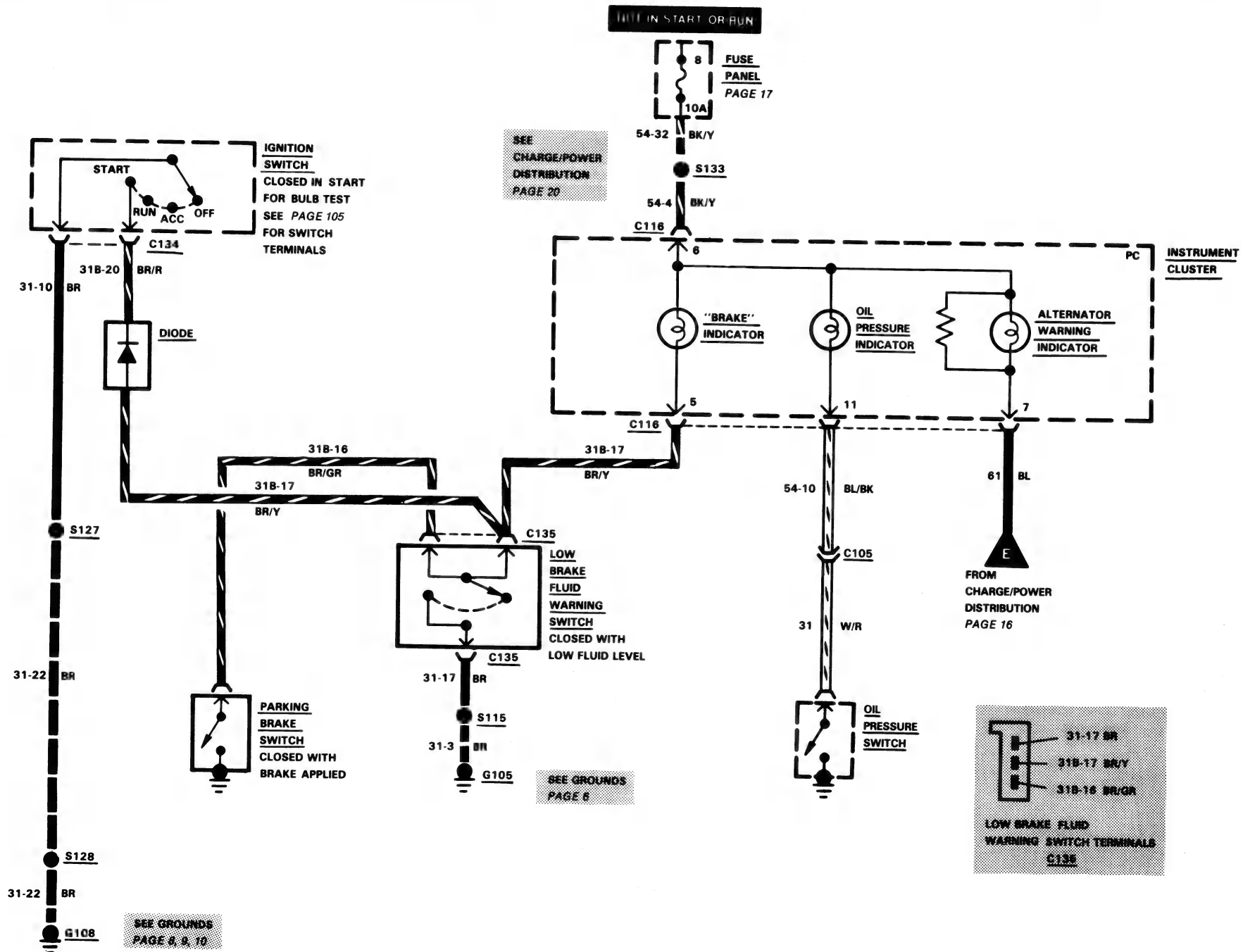
Voltage is applied at all times through **Fuse Link B** to this circuit. The **Ignition Switch** and other components on this circuit are connected to the **Front Door Jamb Switches**. Current flows through the **Ignition Switch** to the **Dual Warning Buzzer**. When either the **LH** or **RH Door Jamb Switch** is closed, voltage is available to turn on the **Ignition Key Buzzer**.

TROUBLESHOOTING HINTS

KEY WARNING BUZZER DOES NOT SOUND

- If buzzer does not sound, check connection at **Dual-Warning Buzzer**.
- Apply ground to **BR/R** wire at **Dual Warning Buzzer**. If buzzer sounds, check **Key Warning Switch** and ground path to **Door Jamb Switches**.
- Check continuity at both **Door Jamb Switches**.

52 WARNING INDICATORS (BRAKE, ALTERNATOR, OIL PRESSURE)



HOW THE CIRCUIT WORKS

BRAKE INDICATOR

The "Brake" Indicator goes on:

1. With the **Ignition Switch** in **START**, to test the bulb. (This connection is closed just before the **Starter Relay** pulls in.)
2. When the brake fluid is low.
3. With the **Ignition Switch** in **RUN**, if the park brake is applied.

ALTERNATOR CHARGE INDICATOR LAMP

Alternator Charge Indicator Lamp glows when there is no alternator output.

With the **Ignition Switch** in **Start** or **Run**, battery current flows through the **Alternator Charge Indicator Lamp** to the **Alternator** and the lamp comes **On**.

When the **Alternator** builds up enough voltage to energize a circuit in the **Electronic Voltage Regulator**, the **Alternator Charge Indicator Lamp** goes out.

OIL PRESSURE INDICATOR

The **Oil Pressure Warning Light** connects to the **Oil Pressure Switch**. The sender is a pressure-sensitive switch. When the oil pressure is low, the switch is closed; when the oil pressure is normal, the switch is opened.

TROUBLESHOOTING HINTS

ALTERNATOR CHARGING INDICATOR LAMP STAYS ON AFTER VEHICLE IS STARTED

- Check **Fuse Link B** at **Starter Relay**.
- Check **Alternator Belt** tension.
- Check **Battery** terminals and cable clamps.
- Check for clean and tight connections on **Alternator**, and **Starter Relay**.
- For further diagnosis refer to Shop Manual Section 31-01.

COMPONENT LOCATION

		Page-Figure	Color	Terminals
Brake Fluid Level Switch . . .	At brake master cylinder	53-1		
Ignition Switch	RH side of steering column			
Parking Brake Switch	At park brake lever	55-1		
Connector C105	LH fender apron	25-3	GY	8
Connector C116	At instrument cluster	46-2	BK	13
Connector C134	At steering column to ignition switch	26-6, 68-1	BR	6
Connector C135	At dual brake warning switch		BK	3
Ground G105	Near LH flasher T/O	12-1		
Ground G108	LH cowl panel	13-3		
Splice S115	LH engine compartment near horn			
Splice S127	Behind center of I/P	78-1		
Splice S128	Near LH door ajar switch T/O	78-1		
Splice S133	Center of I/P, near tripmarker			

ANY WARNING INDICATOR STAYS ON WHEN SYSTEMS ARE NORMAL

- Check for faulty switch.
- Check for shorts to ground in wiring between printed circuit and switch.

ANY WARNING INDICATOR DOESN'T GO ON

- Check bulb. Check continuity from printed circuit to ground.
- Check for voltage at **BK/Y** wire of printed circuit.
- Replace printed circuit.

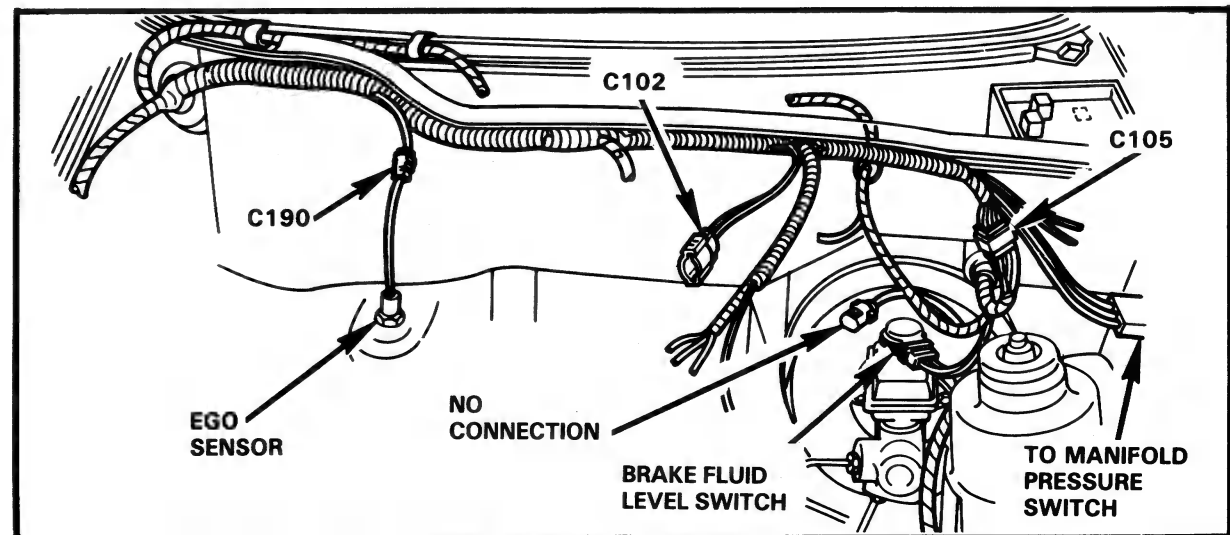
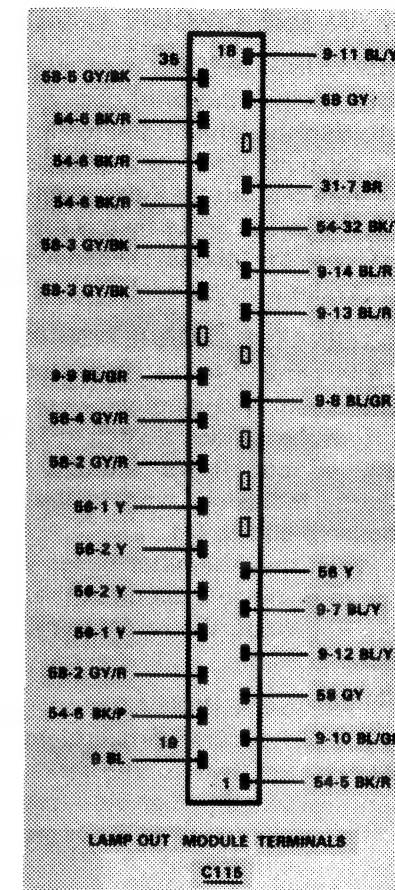
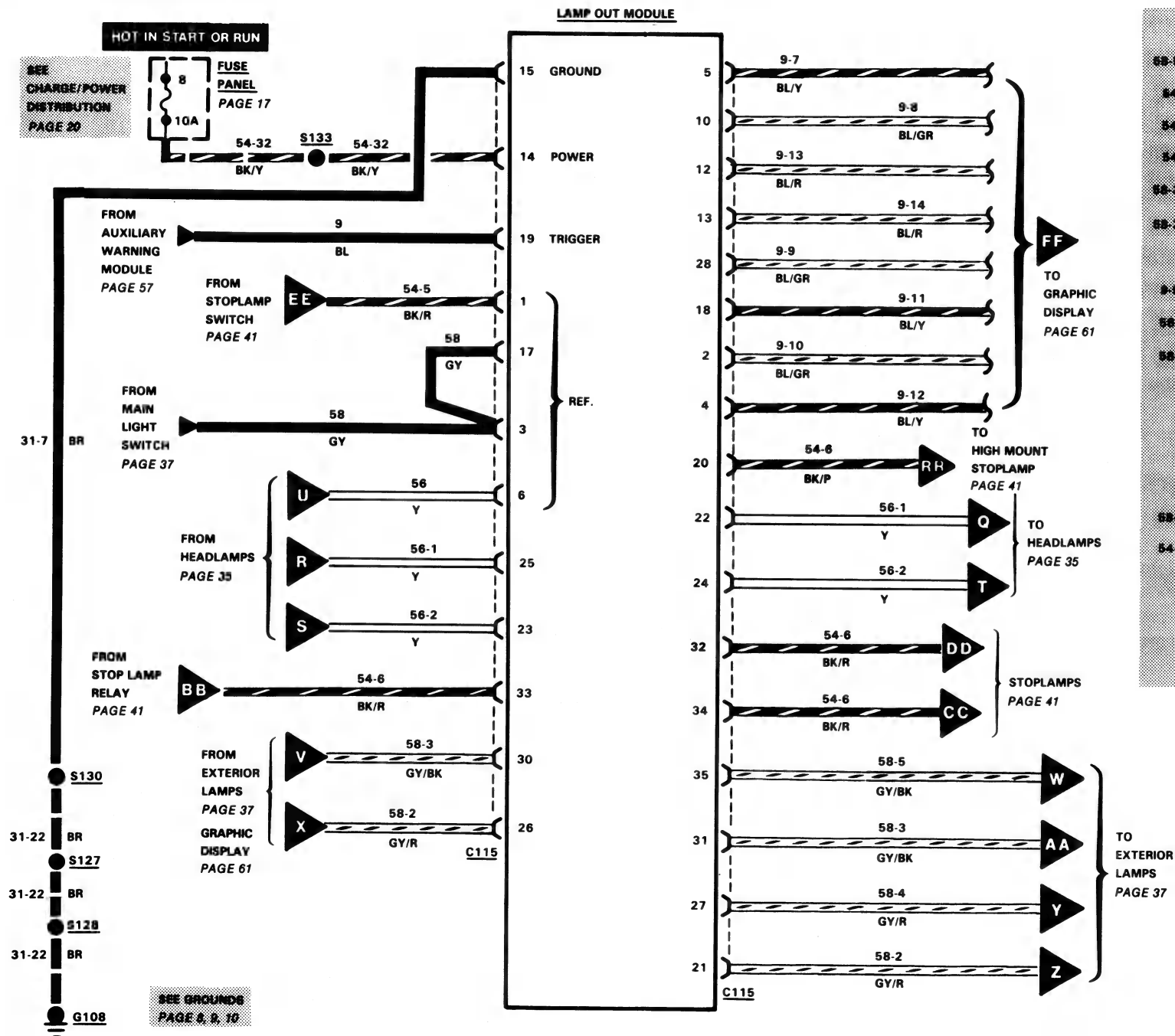


Figure 1 - LH Dash Panel Wiring

54 LAMP OUT WARNING



HOW THE CIRCUIT WORKS

The **Lamp Out Module** monitors the **Low Beam Headlamps, Stoplamps, Taillamps** and **Parking Lamps**. The **Lamp Out Module** receives inputs from these circuits and displays any bulb outages on the **Graphic Display**.

TROUBLESHOOTING HINTS IF SYSTEM MALFUNCTIONS

Test **Lamp Out Module** operation with the **Ignition Switch** in **START**. If any lamp out indicator in the **Graphic Display** fails to illuminate, replace bulb. If **Graphic Display** is OK, check connections and repair or replace **Lamp Out Module**.

- Check **Fuse 8** and voltage on circuit **54-32 (BK/Y wire)**.
- If one circuit does not work, check continuity of wires. Replace or repair as required.

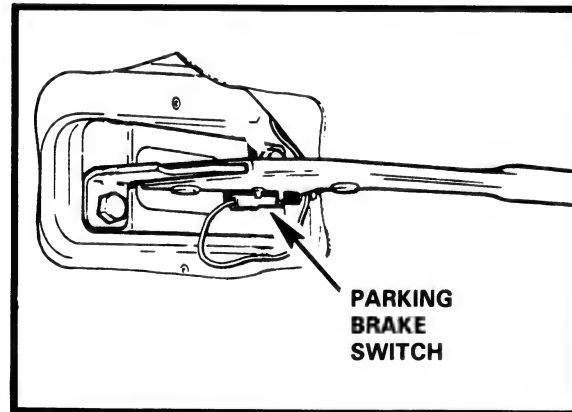


Figure 1 – Parking Brake Switch

COMPONENT LOCATION

		Page-Figure	Color	Terminals
Lamp Out Module	RH cowl panel	34-3		
Connector C115	At lamp out module	34-3,34-4	BR	15
Ground G108	LH cowl panel	13-3		
Splice S127	Behind center of I/P	78-1		
Splice S130	Behind RH side of I/P	78-1		
Splice S133	Center of I/P, near tripminder			

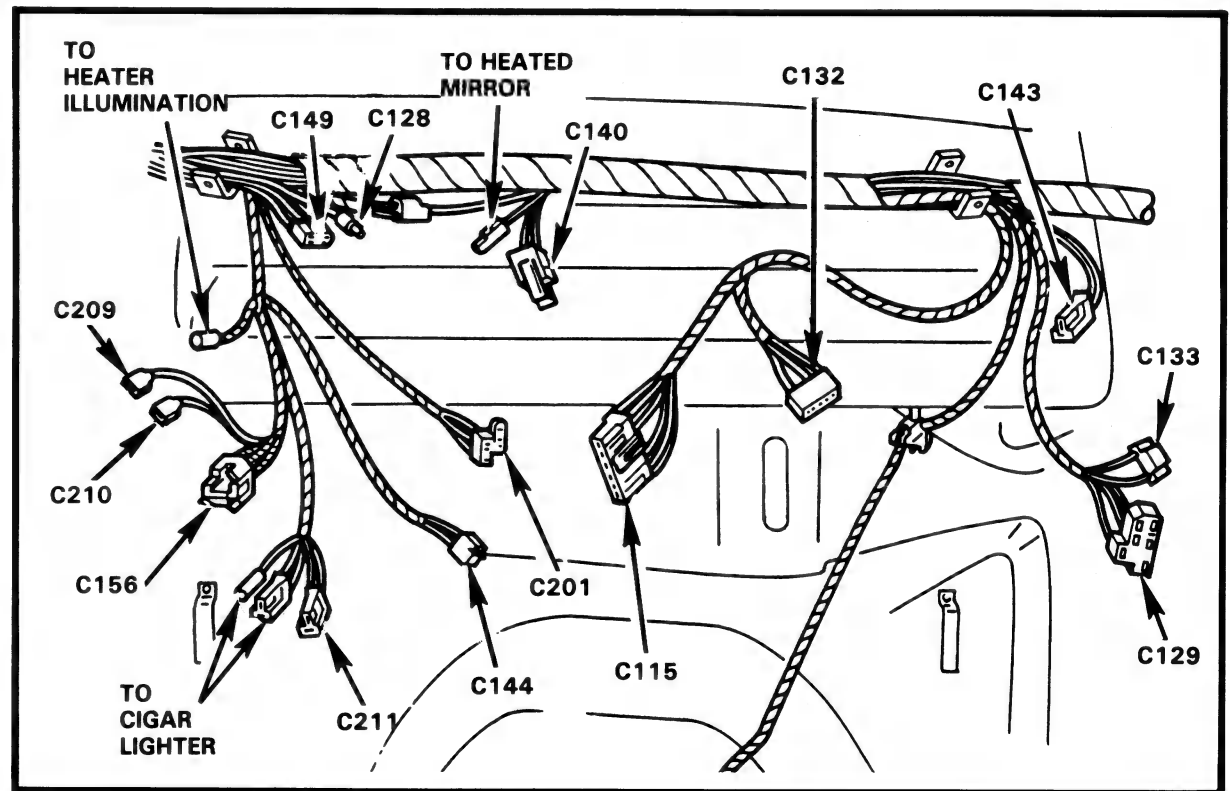
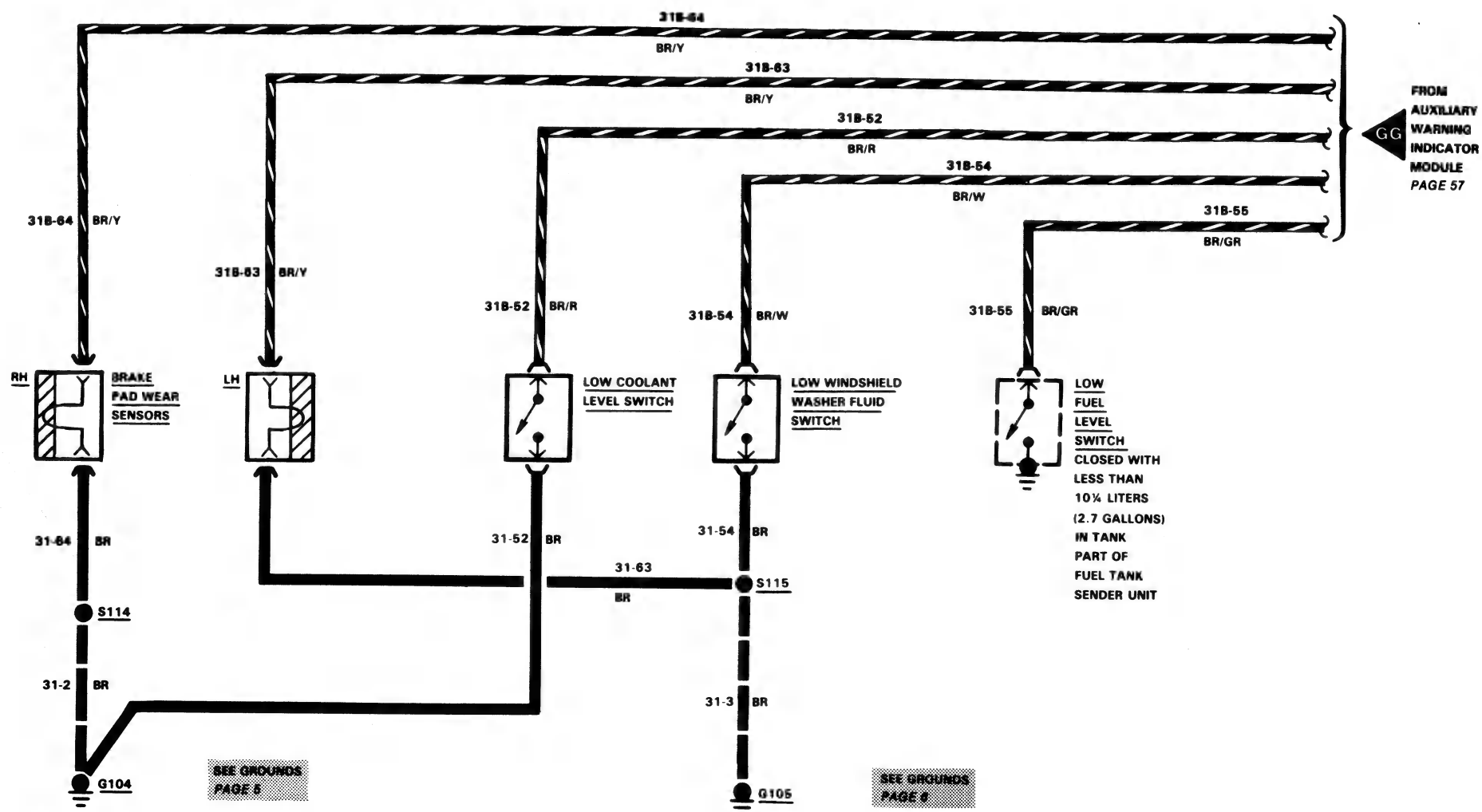
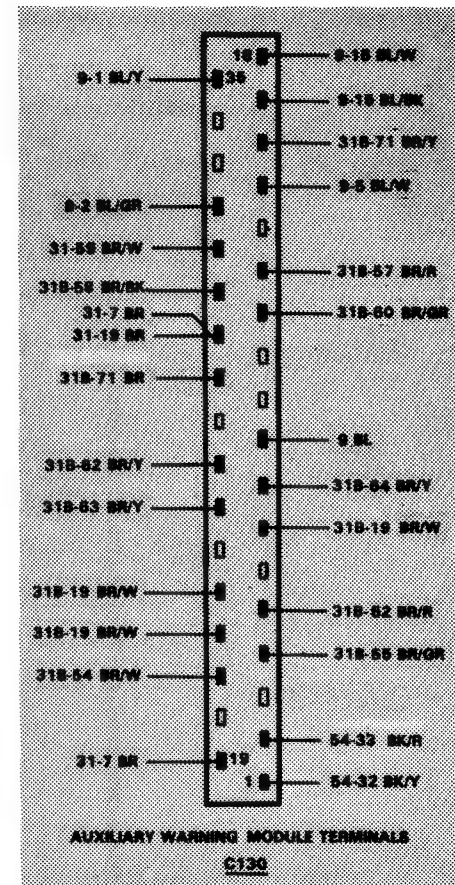
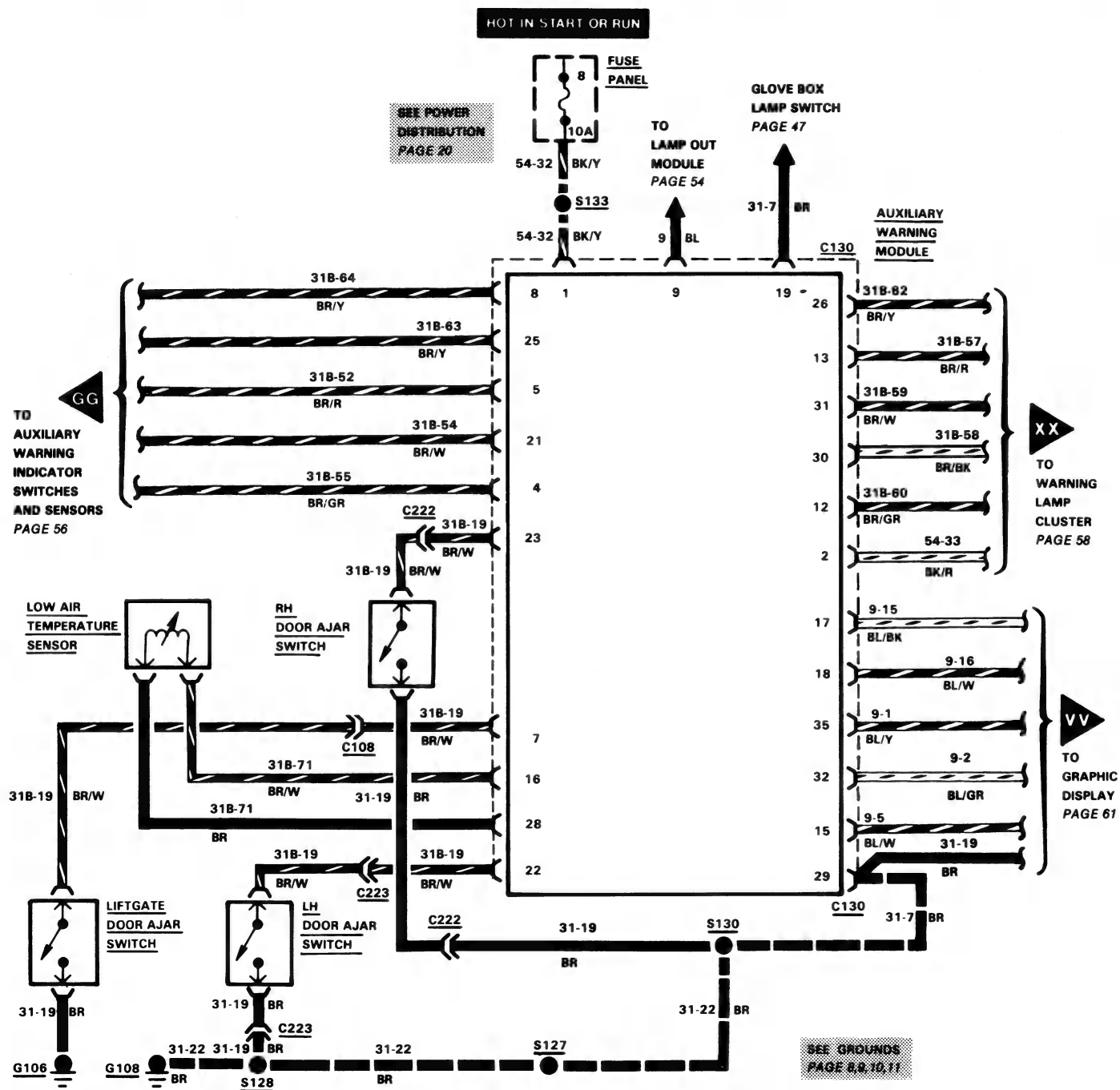


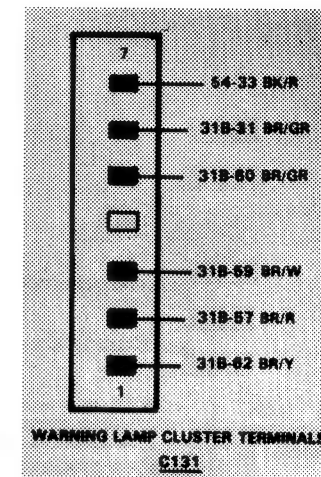
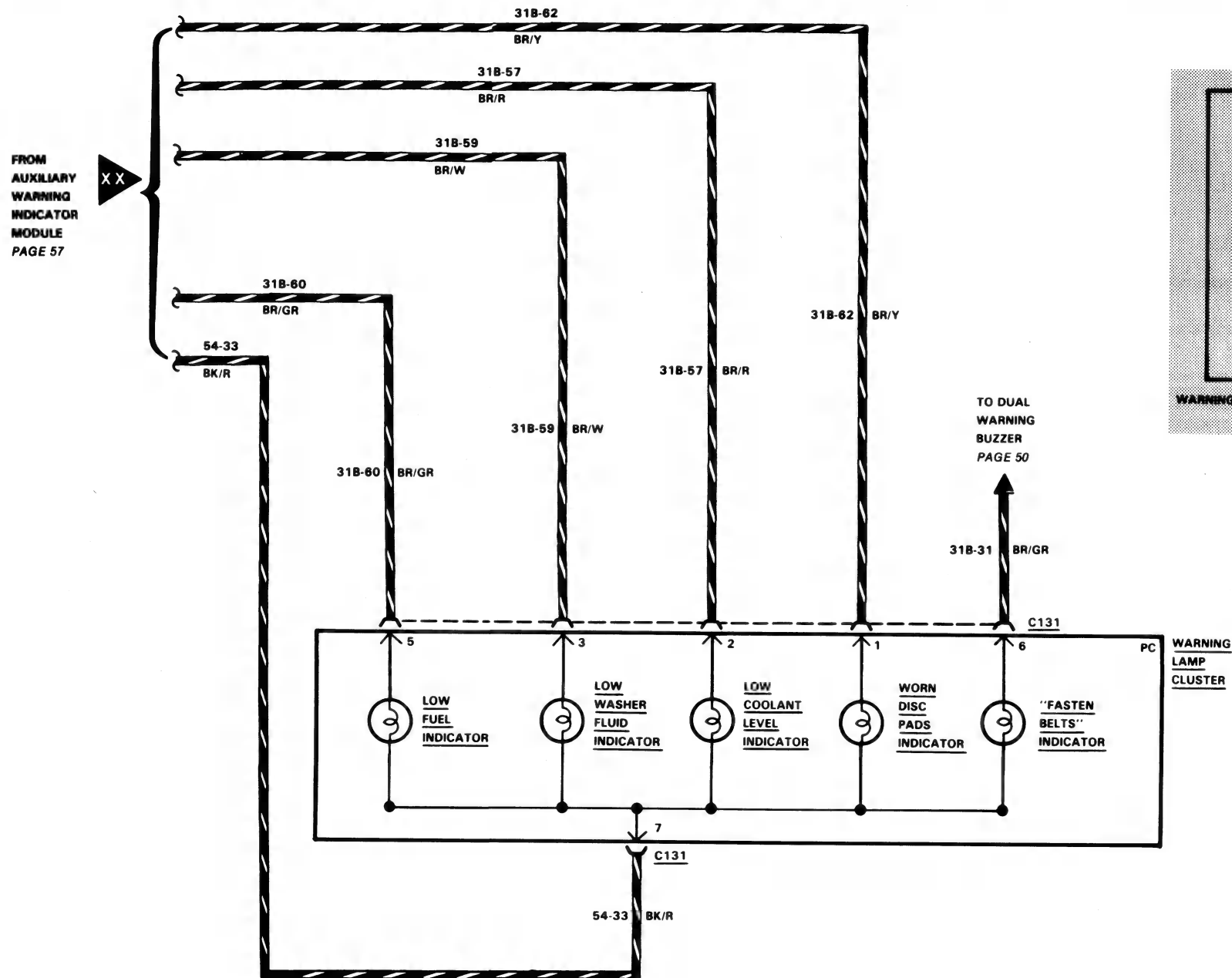
Figure 2 – Instrument Panel—RH Side

56 AUXILIARY WARNING INDICATORS





58 AUXILIARY WARNING INDICATORS



HOW THE CIRCUIT WORKS

AUXILIARY WARNING SYSTEM

This warning system consists of the **Auxiliary Warning Module**, the **Graphic Display Module** and five warning lamps.

These lamps will glow for approximately five seconds after the **Ignition Switch** is turned to the ON position to allow for a visual check of the lights.

If all systems are acceptable, the lamps will go out.

Should a lamp continue to flash off and on for half a minute and then go out, a circuitry fault may exist.

AUXILIARY WARNING LAMP(S)

FRONT BRAKE PAD WARNING LAMP

This lamp will glow when a front disc brake inner pad has worn to a 2 mm (0.079 inch) thickness. The pads must be replaced as soon as possible.

ENGINE COOLANT WARNING LAMP

Indicate the coolant level in the **Coolant Reservoir** has fallen below the MIN mark.

LOW WINDSHIELD WASHER FLUID LEVEL WARNING LAMP

This lamp will glow when the **Washer Fluid Reservoir** is below 1/4 full.

LOW FUEL LEVEL WARNING LIGHT

When the fuel level is approximately 1/8 of a tank, this warning lamp will flicker or steadily glow.

SEAT BELT WARNING LAMP AND BUZZER

This lamp will glow and a buzzer will sound when the **Ignition Switch** is turned to the ON position and the seatbelt is not in use to remind you to fasten your seat belt. It will diminish after approx. 8 seconds.

COMPONENT LOCATION

		Page-Figure	Color	Terminals
Brake Pad Wear Sensors . . .	Inside respective disc pads	60-1		
Door Ajar Switches	Near respective door latch striker	60-3		
Low Air Temperature Sensor	Behind RH side of front bumper			
Low Coolant Level Switch .	In coolant reservoir			
Low Fuel Level Switch	Part of fuel sender unit in fuel tank			
Low Windshield Washer Switch	In windshield washer reservoir	25-3		
Connecto C108	In liftgate, near door latch	81-1	BK	1
Connector C130	At auxiliary warning module	34-4	BR	35
Connector C131	At warning lamp cluster		BK	7
Connector C222	RH cowl panel		W	2
Connector C223	LH cowl panel		W	2
Ground G104	RH side engine compartment near parking lamp	21-1		
Ground G105	Near LH flasher T/O	12-1		
Ground G106	In liftgate near latch	12-2		
Ground G108	LH cowl panel	13-3		
Splice S114	RH side of engine compartment near horn T/O			
Splice S115	LH side of engine compartment near horn T/O			
Splice S127	Behind center of I/P	78-1		
Splice S128	Near LH door ajar switch T/O behind I/P	78-1		
Splice S130	Behind RH side of I/P	78-1		

This system also checks **Brake Pedal Switch** operation. This **Brake System Warning Lamp** will stay on until the **Brake Pedal** is depressed once.

TROUBLESHOOTING HINTS

IF SYSTEM MALFUNCTIONS

- Check that connectors are clean and dry and properly engaged.
- Check **Fuse 8**.
- Disconnect C130 and check for continuity to ground from (31-7) **BR** wire, **Pin 29**.
- For further diagnosis procedures, refer to the Shop Manual, Section 33-92.

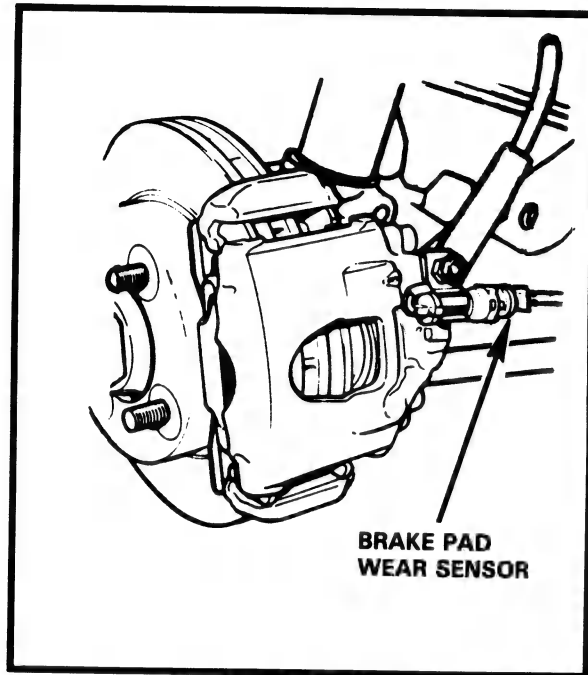


Figure 1 — Brake Pad Wear Sensor

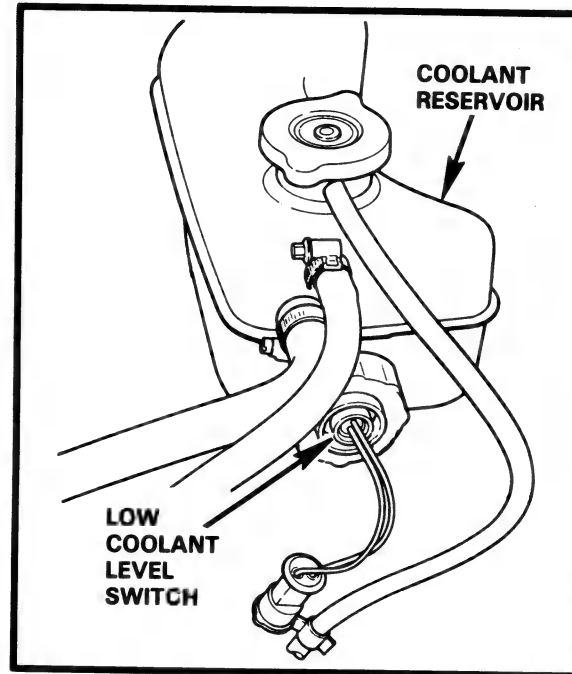


Figure 2 — Low Coolant Level Switch

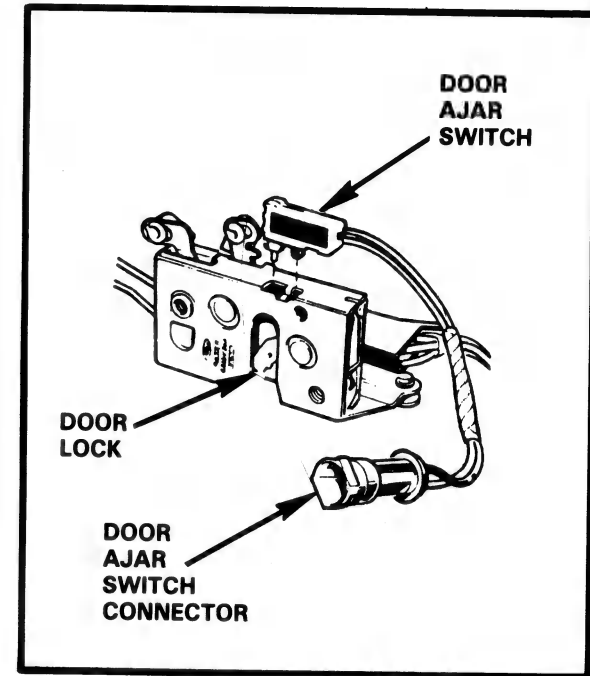
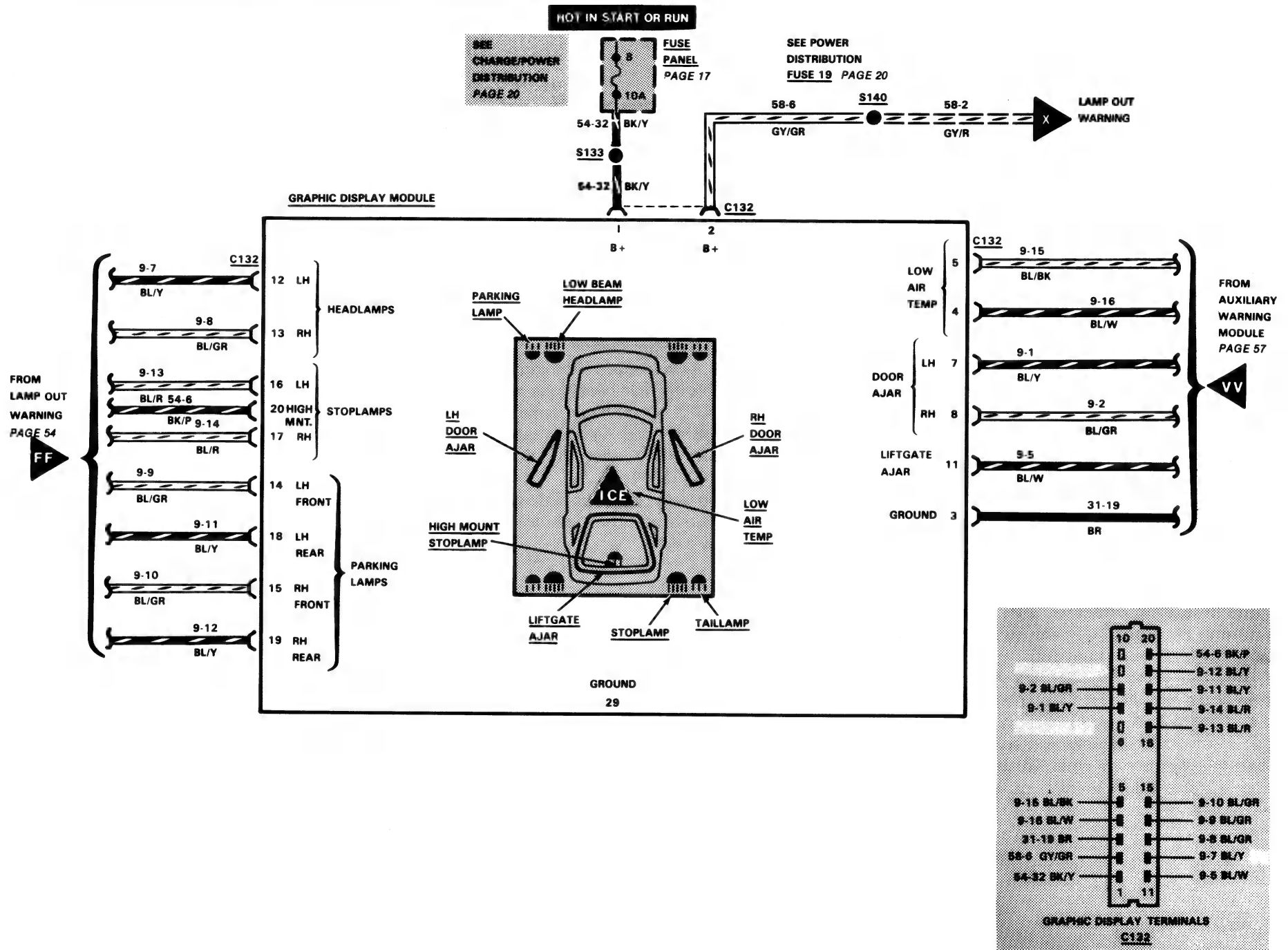


Figure 3 — Door Ajar Switch



WARNING

This is a convenience feature. It is not designed to be a replacement or substitute for proper periodic inspection and maintenance of the vehicle.

HOW THE CIRCUIT WORKS

The **Graphic Warning Display** monitors seven functions. The seven items displayed are: **Brake Lamp**, **Tail Lamp**, low beam **Headlamp**, **Front Parking Lamp**, **Door** and **Liftgate Ajar** and **Low Air Temperature Warning**. The bulb outages are monitored by the **Bulb Outage Module** (part of the **Lamp Out Warning** system). The **Door** and **Liftgate Ajar**, and **Low Air Temp. Warning** are monitored by the **Auxiliary Warning Module**. The modules then send signals to the **Graphic Display** when these systems are not functioning properly.

When the front or rear running lamps are turned on by the **Main Light Switch** (circuit 58 GY), the **Tail Lamp** and **Front Parking Lamp** indicator will show if a bulb is burned out.

The **Headlamp** indicator will show only a headlamp low beam filament burn-out. It does not show high beam burn-out.

The **Brake Lamp** indicator will show if a brake lamp or the **High Mount Stop Lamp** bulb is burnt out when the brake is applied.

The **Left Hand Brake Lamp** serves a dual purpose. It will illuminate when either a high mount stop or brake lamp is burned out.

COMPONENT LOCATION

		Page- Figure	Color	Terminals
Graphic Display	At center of dash panel	61-1		
Connector C132	At graphic display	61-1	BK	20

The **Door** and **Liftgate Ajar Switches** close when a door is open or not closed completely. When any switch closes, the **Door** or **Liftgate Ajar Warning Indicator** goes on. The buzzer will also sound if the key is in the ignition.

The **Low Air Temperature Warning Indicator** warns of possible icy road conditions by lighting up the word "ICE" when the air temperature is below 4°C (38°F) and lighting the triangle around the word "ICE" when the air temperature falls to 0°C (32°F).

If any warning lamp continues to glow after the condition is repaired, a fault in the **Auxiliary Warning System** may exist.

TROUBLESHOOTING HINTS

- Check **Fuse 8** and voltage on the **BK/Y** wire.
- If one circuit does not work, check continuity of wires. Replace or repair as required.
- Check continuity of **BR** to **G108**.
- For detailed tests, refer to Shop Manual Section 33-50.

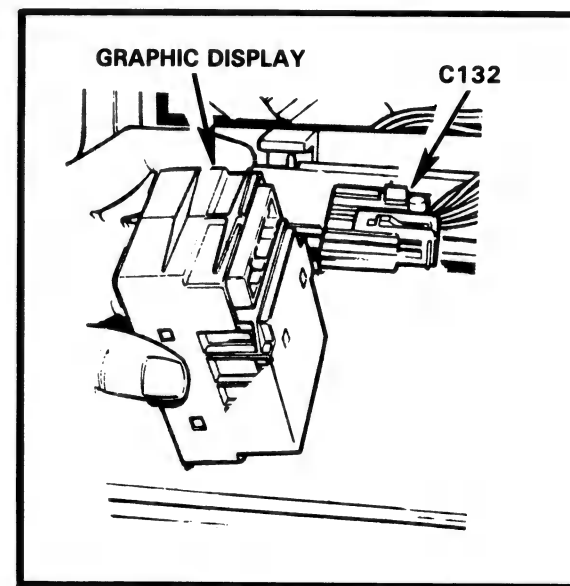


Figure 1 — Graphic Display

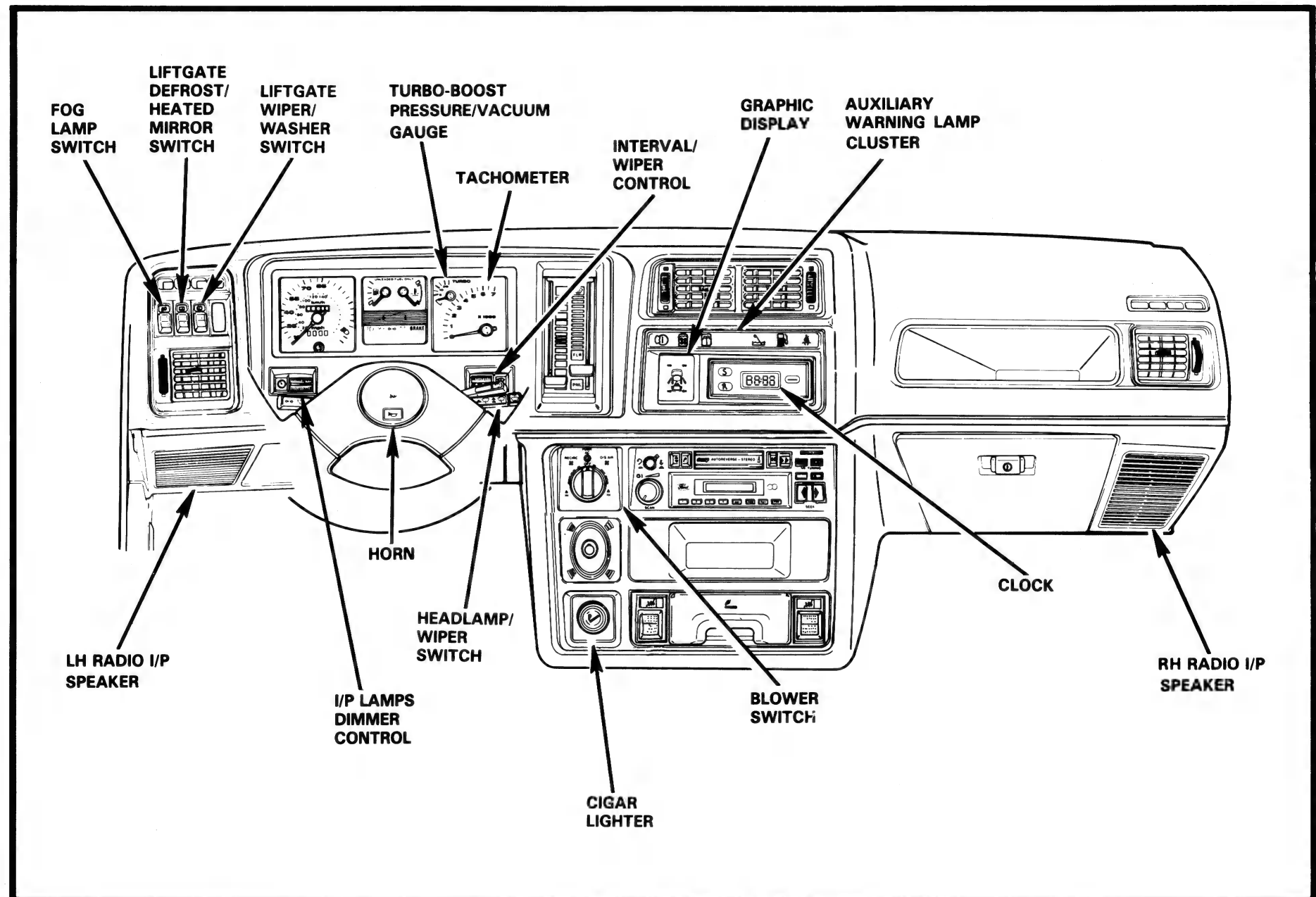
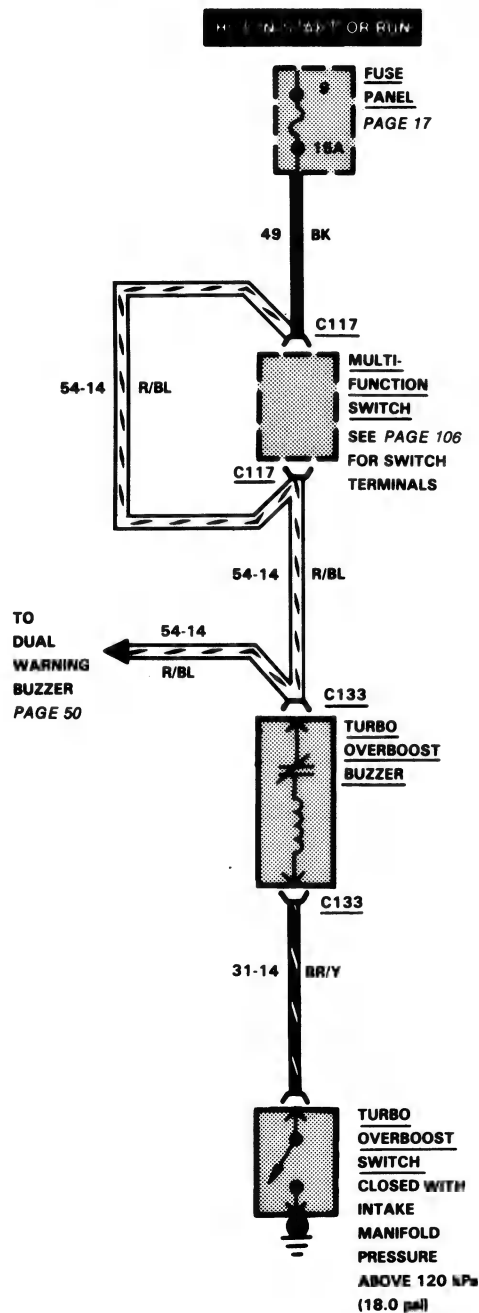


Figure 1 — I/P Controls and Displays

64 TURBO OVERBOOST WARNING



COMPONENT LOCATION

		Page-Figure	Color	Terminals
Turbo Overboost Buzzer . . .	Behind RH side of I/P			
Turbo Overboost Switch . . .	LH fender apron	25-3		
Connector C117	At turn signal stalk switch	40-2	BK	10
Connector C133	At turbo overboost buzzer	55-2	BR	3

HOW THE CIRCUIT WORKS

When manifold pressure exceeds about 120 kPa (18 psi), the engine is overboosted. The turbo pressure switch closes, and the overboost buzzer sounds.

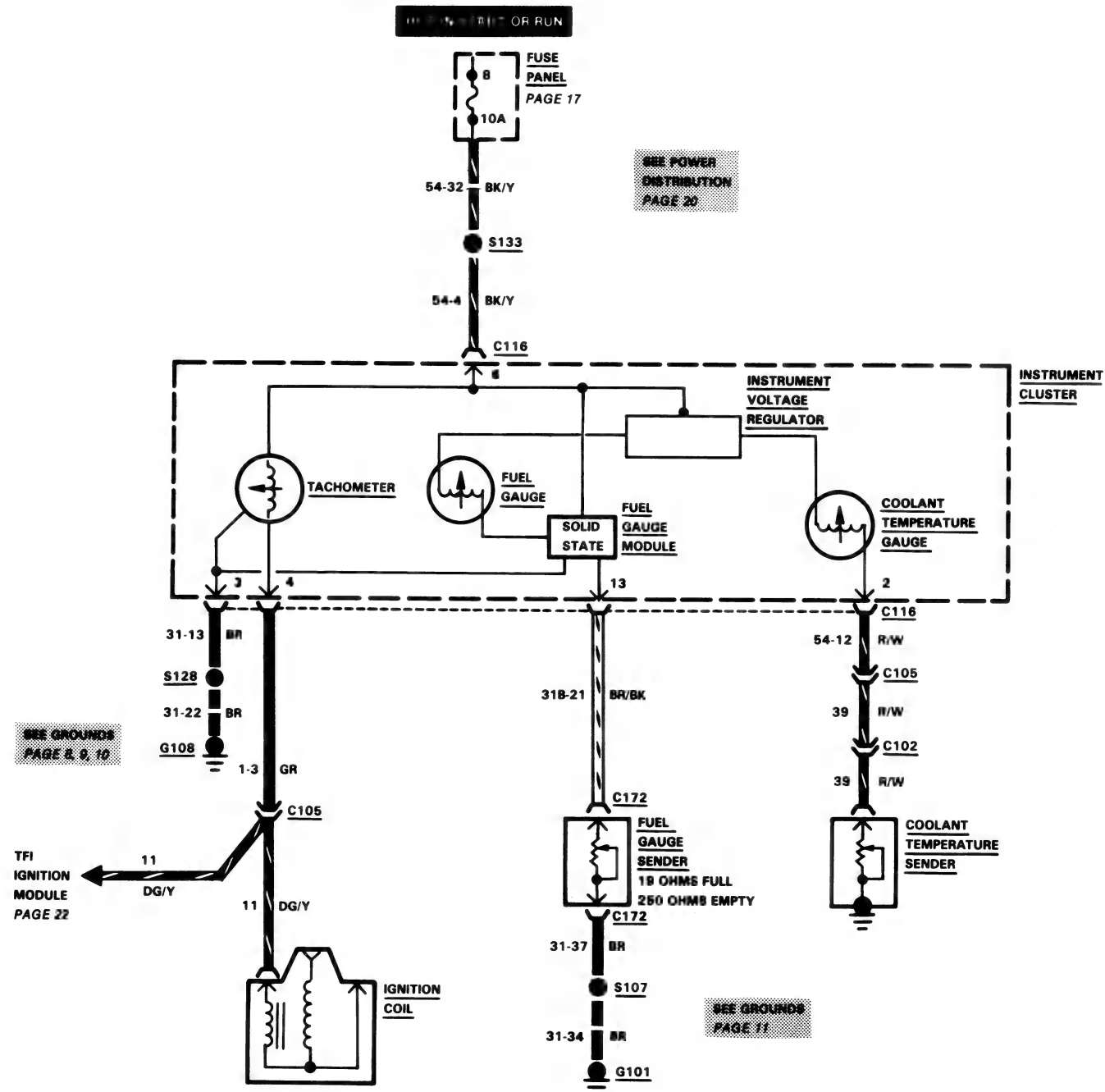
TROUBLESHOOTING HINTS

TURBO OVERBOOST BUZZER WON'T TURN OFF

- Check for short circuit in Turbo Overboost Switch and in BR/Y wire from Turbo Overboost Buzzer to Turbo Overboost Switch.

TURBO OVERBOOST BUZZER DOESN'T SOUND WHEN TURBO IS OVERBOOSTED

- Check if seatbelt buzzer sounds to check Fuse 9.
- Verify ground circuit from BR/Y at Turbo Overboost Buzzer to Turbo Overboost Switch.



HOW THE CIRCUIT WORKS

The **Fuel Gauge** connects to the **Fuel Gauge Sender**. The sender is a variable resistor connected to a float in the fuel tank. When the fuel is low, resistance is high; when fuel is high, resistance is low.

The **Coolant Temperature Gauge** connects to the **Coolant Temperature Sender**. The sender is a temperature-sensitive variable resistor. When coolant temperature is low, resistance is high; when coolant temperature is high, resistance is low.

TROUBLESHOOTING HINTS

GAUGE OUT OF CALIBRATION

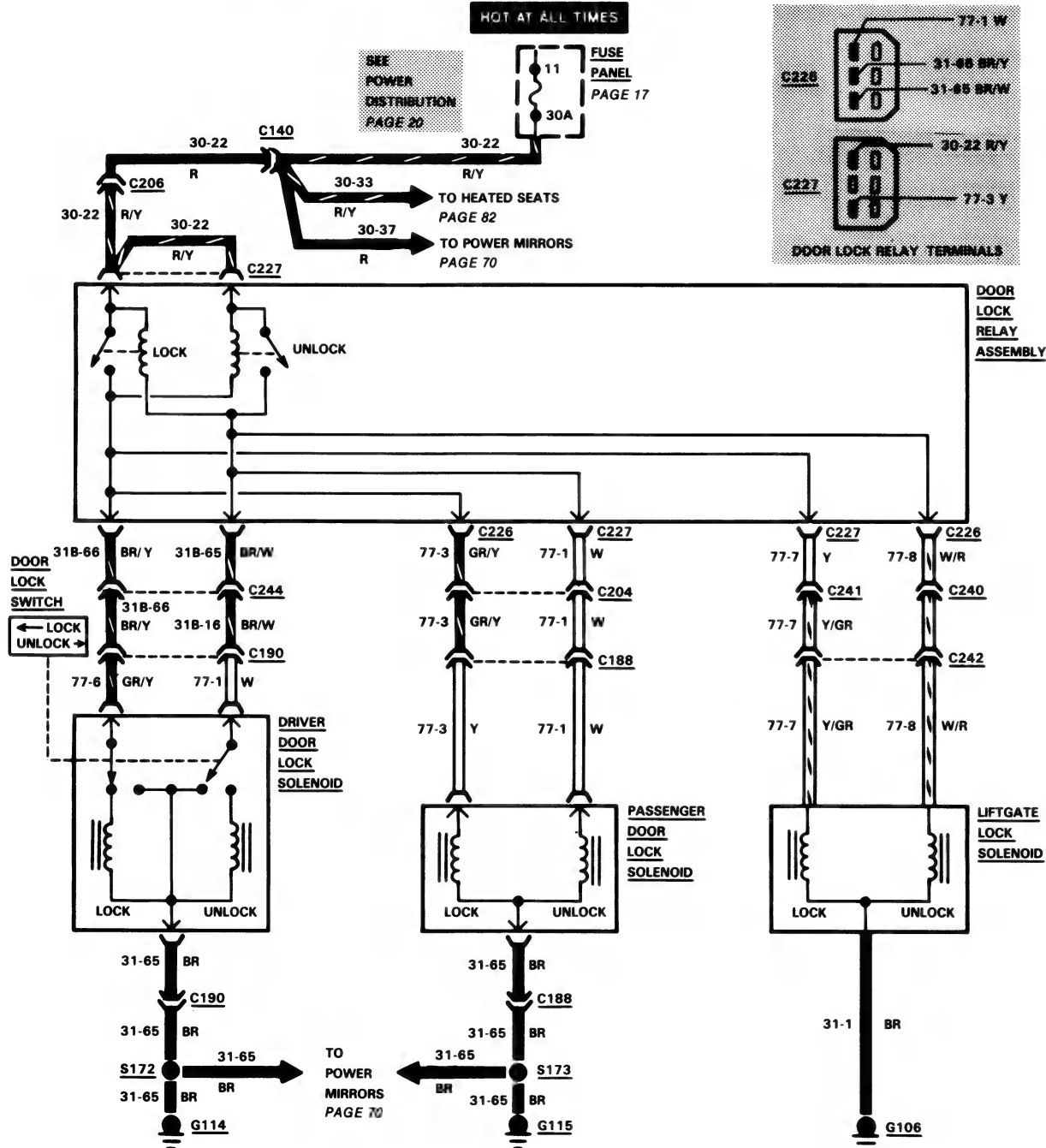
- Disconnect wire from sender. Check for broken or corroded terminals.
- Test with Rotunda Instrument Gauge Tester 021-00034 using instructions.
- If Tester is unavailable, connect test light between gauge lead and ground. If light stays on or blinks erratically, replace regulator. If light won't light, check for open circuit in gauge or wiring. Normal gauge resistance is 10 to 14 ohms.
- Check gauge calibration with 19 ohm (high) and 250 ohm (low) resistors. If gauge tests within calibration, replace sender. If gauge tests out of calibration, replace gauge.

COMPONENT LOCATION

		Page-Figure	Color	Terminals
Coolant Temperature				
Sender	Rear LH side of engine			
E-Core Ignition Coil	LH fender apron	25-3		
Fuel Gauge Sender	Part of fuel pump/sender assembly inside fuel tank			
Connector C102	LH fender apron	32-1	BK	4
Connector C116	At instrument cluster	13-3	BK	13
Connector C172	At fuel sender		BK	3
Ground G101	Near license lamps			
Ground G108	LH cowl panel	13-3		
Splice S107	LH rear panel, near tail lamp			
Splice S128	Near LH door ajar switch T/O behind I/P	78-1		
Splice S133	Center of I/P, near tripminder			

NO TACHOMETER INDICATION

- Check **Fuse 8**.
- Check that the 4 nuts on the tach terminal studs behind the cluster, and the printed circuit connector to the cluster, are tight.
- With the **Ignition Switch** in the RUN position, check for battery voltage between the B terminal and the G terminal (as viewed from rear of cluster).
- Check for continuity from G terminal to G108.
- Disconnect the **Ignition Coil** connector. Check for continuity between the GR wire and the S terminal.



HOW THE CIRCUIT WORKS

Power to the **Door Lock Relay Assembly** is available at all times through Fuse 11. Moving the **Driver Door Lock Switch** to the LOCK position, momentarily energizes the lock relay in the **Door Lock Relay Assembly**. Current then flows to the lock solenoid in both **Door Lock Solenoids** and the **Liftgate Lock Solenoid**.

Moving the Driver Door Lock Solenoid to the UNLOCK position, momentarily energizes the unlock relay in the **Door Lock Relay Assembly**. Current then flows to the unlock solenoid in both **Door Lock Solenoids** and the **Liftgate Lock Solenoid**.

TROUBLESHOOTING HINTS

POWER LOCKS DON'T WORK

- Check for battery voltage at 30-22 (R/Y) wire. If no voltage is present, repair open in 30-22 (R/Y) wire or replace fuse.
- Check for momentary battery voltage at **Door Lock Relay Assembly** terminals 31B-66 BR/Y, 77-3 GR/Y, and 77-7 Y while momentarily jumping to ground circuit 31B-65 (BR/W). If no voltage is present, replace **Door Lock Relay Assembly**.
- Check for momentary battery voltage at **Door Lock Relay Assembly** terminals 31B-65 BR/W, 77-1 W, and 77-8 W/R while momentarily jumping to ground circuit 31B-66 (BR/Y). If no voltage is present, replace **Door Lock Relay Assembly**.
- Check **Driver Door Lock Solenoid** terminal 31-65 BR to ground. If there is no continuity, repair open to G114.

68 POWER DOOR LOCKS

- Check for momentary battery voltage at solenoid terminals 77-6 GR/Y, 77-3 Y, and 77-7 Y/GR while momentarily jumping to ground circuit 77-1 (W) at **Driver Door Lock Solenoid**.

If voltage is not present at any solenoid, repair open in circuit 77-1 W and/or 31B-65 (BR/W) between solenoid and relay.

If there is no voltage at only one solenoid, repair open between that solenoid and **Door Lock Relay Assembly**.

- Check for momentary battery voltage at solenoid terminals 77-1 W, 77-8 W/R while momentarily jumping to ground circuit 77-6 (GR/Y) at **Driver Door Lock Solenoid**.

If voltage is present, replace **Driver Door Lock Solenoid**. If there is no voltage at only one solenoid, repair open between that solenoid and **Door Lock Relay Assembly**.

NOTE

If the Passenger Door Lock Solenoid or Liftgate Lock Solenoid still do not work, check ground circuit for continuity. If OK, replace that solenoid. If not OK, repair open to ground.

COMPONENT LOCATION

		Page-Figure	Color	Terminals
Door Locking Relay	Behind lower RH side of I/P on evaporator			
Door Lock Actuator				
(Driver)	In driver door			
(Passenger)	In passenger door	60-3		
Power Door Lock Switch	At driver's door I/S handle			
Connector C140	Behind LH side of I/P	55-2	RED	2
Connector C188	At passenger door lock solenoid		BK	3
Connector C190	At RH side of dash panel	53-1	W	1
Connector C204	At RH A-pillar	68-2	RED	2
Connector C206	At RH A-pillar		RED	2
Connector C226	At door lock relay assembly		GR	6
Connector C227	At door lock relay assembly		BK	6
Connector C240				
Connector C241				
Connector C242	At liftgate lock solenoid			2
Connector C244				
Ground G114	Near A-pillar driver side	68-1		
Ground G115	Near A-pillar passenger side	68-2		
Ground G106	In liftgate near liftgate lock solenoid			
Splice S172	Inside driver's door			
Splice S173	Inside passenger's door			

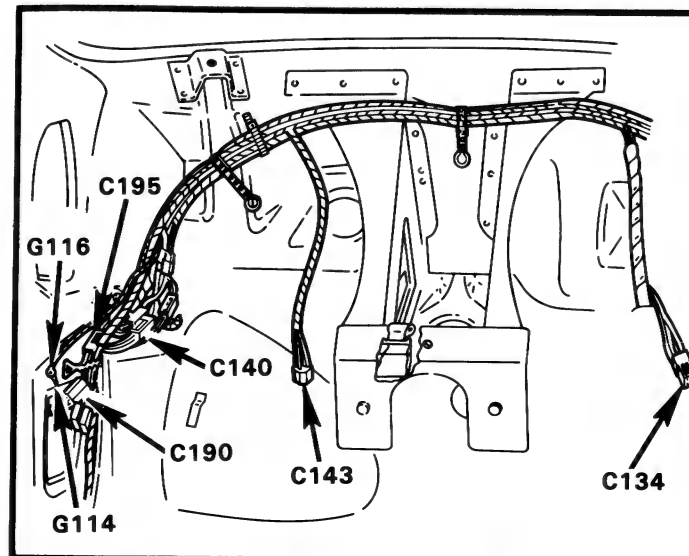


Figure 1 - LH A-Pillar

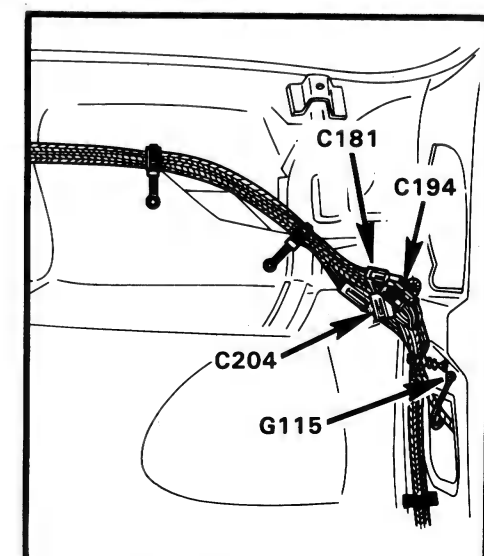
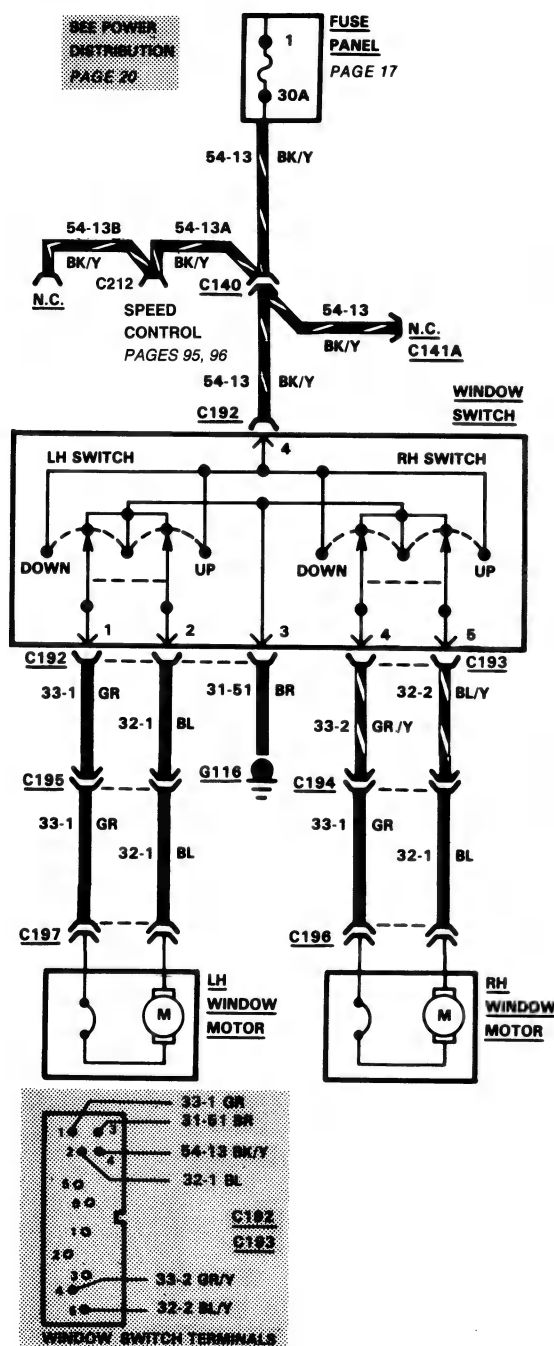


Figure 2 - RH A-Pillar



COMPONENT LOCATION

		Page-Figure	Color	Terminals
Window Motors	In RH and LH doors respectively	69-2		
Window Switch	In console	69-1		
Connector C140	Behind LH side I/P	68-1	RED	2
Connector C192	At window switch	69-1, 84-4	BK	6
Connector C193	At window switch	69-1, 84-4	BK	5
Connector C194	At passenger side A-pillar	68-2		2
Connector C195	At driver side A-pillar	68-1		2
Connector C196	At RH power window motor		BK	2
Connector C197	At LH power window motor	69-2	BK	2
Ground G116	At driver side A-pillar	68-1		

HOW THE CIRCUIT WORKS

The switch in the center console sends current through the **Window Motor** in one direction for UP, and the opposite direction for DN.

In OFF position, both motor wires are grounded through separate switch contacts.

When the DN switch is pushed, power flows to the DN motor lead. The UP lead acts as ground.

When the UP switch is pushed, power flows to the UP motor lead. The DN lead acts as ground.

Each **Window Switch** directs power to its **Window Motor**, causing it to turn in a clockwise or counterclockwise direction to raise or lower the window.

Power Windows are protected by **Fuse 1**. Each motor assembly also has a circuit breaker to cut off power if a switch is held too long in the UP or DN position.

TROUBLESHOOTING HINTS

ONE/BOTH WINDOWS DO NOT WORK

- Check **Fuse 1**.
- Check **G116**.
- Remove **Window Switches** from floor console. Check for 12 volts and ground at connector. Check continuity of switches.
- Check continuity of wires.
- Remove Window Motor (read Shop Manual Section 42-07. Test as in Section 42-01).

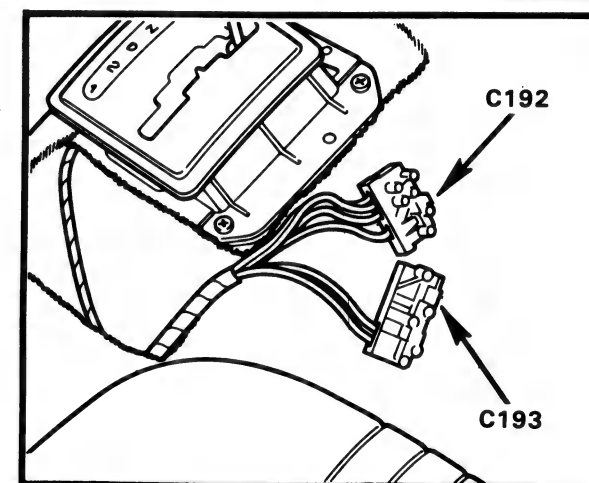


Figure 1—Power Window Switch Connectors

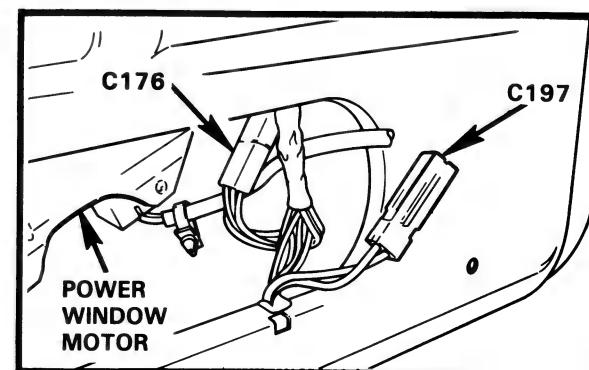
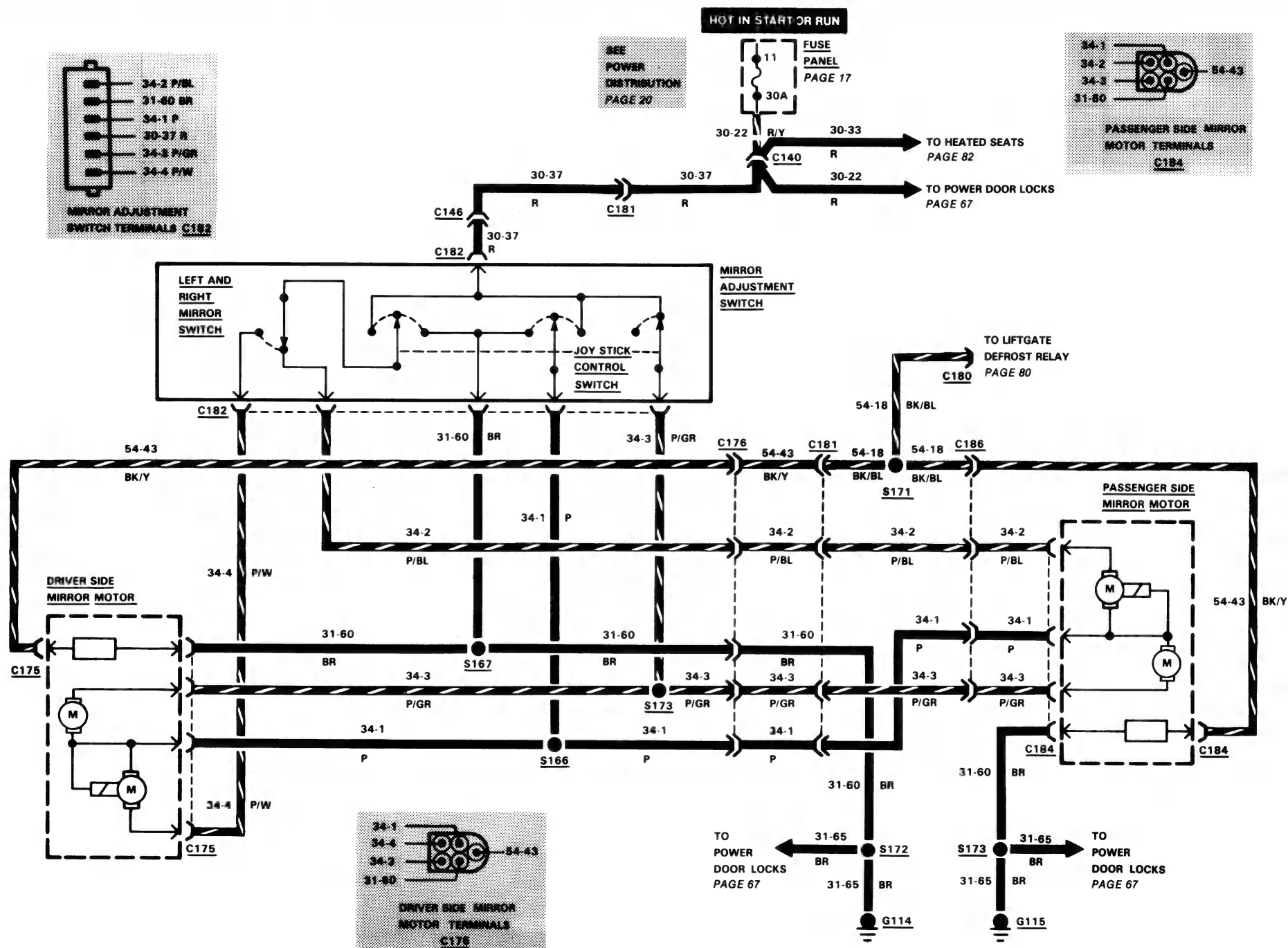


Figure 2—LH Door Shown—RH Typical



HOW THE CIRCUIT WORKS

Each **Power Mirror** is equipped with a motor, operated by a single joystick control switch. The joystick control switch controls both left and right (horizontal) and up and down (vertical) movement.

The left mirror-right mirror switch connects the joystick control to either the **LH** or **RH Power Mirror**.

TROUBLESHOOTING HINTS

BOTH MIRRORS DO NOT WORK

- Check **Fuse 11**.
- Remove driver's door trim panel. Check for voltage at **C146** in **circuit 30-37** using a known good ground.

If no power, check **circuit 30-37** back to fuse. If there is power, check **circuit 31-60 (BK wire)** from **C182** to ground **G114**. If **circuit 31-60** is OK, check **Power Mirror Switch**.

ONE MIRROR DOES NOT WORK

- Check left mirror-right mirror switch.
- Check that in-line connectors are tight.

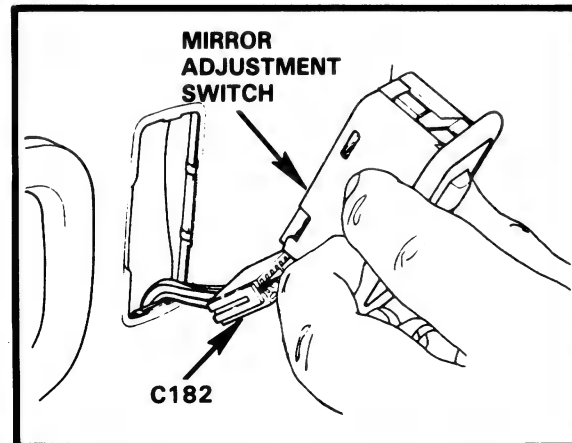


Figure 1—Mirror Adjustment Switch

COMPONENT LOCATION

		Page-Figure	Color	Terminals
Mirror Adjustment Switch	On driver's door	71-1		
Mirror Motor	Inside mirror assembly			
Connector C123	In liftgate just right of latch		GY	2
Connector C140	Behind LH side I/P		RED	2
Connector C146	Inside LH door		BK	1
Connector C175	At LH door mirror motor	71-3	BK	5
Connector C176	Inside LH door		BK	5
Connector C180	Behind center of I/P		BK	1
Connector C181	Near RH A-pillar	68-2	BK/N	5
Connector C182	At mirror adjustment switch	71-1,2	BK	6
Connector C184	At RH door mirror motor	71-3		5
Connector C186	In RH door		BK	5
Ground G114	Near LH A-pillar	68-1		
Ground G115	Near RH A-pillar	68-2		
Splice S166	Inside driver's door			
Splice S167	Inside driver's door			
Splice S171	RH cowl panel			
Splice S172	Inside driver's door			
Splice S173	Inside passenger's door			

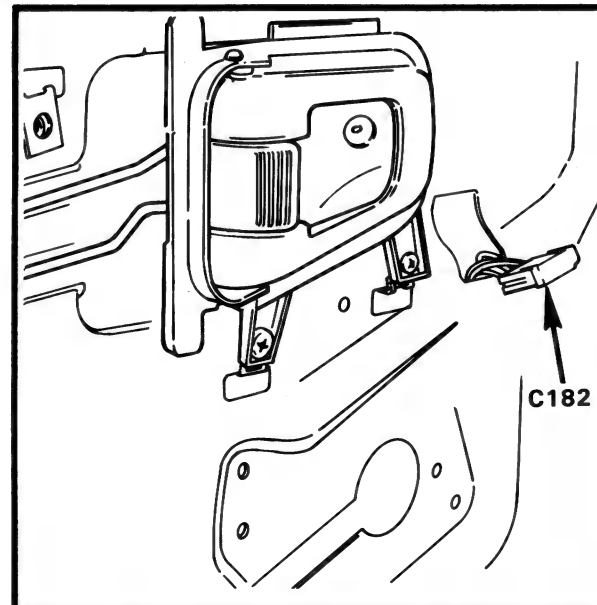


Figure 2—Power Mirror Connector

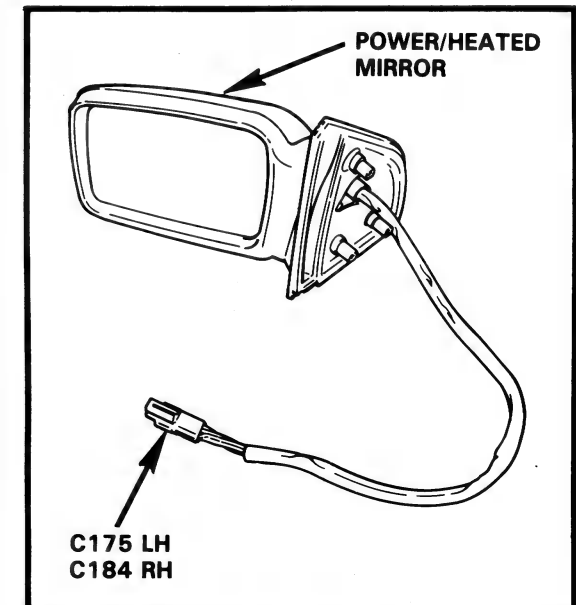
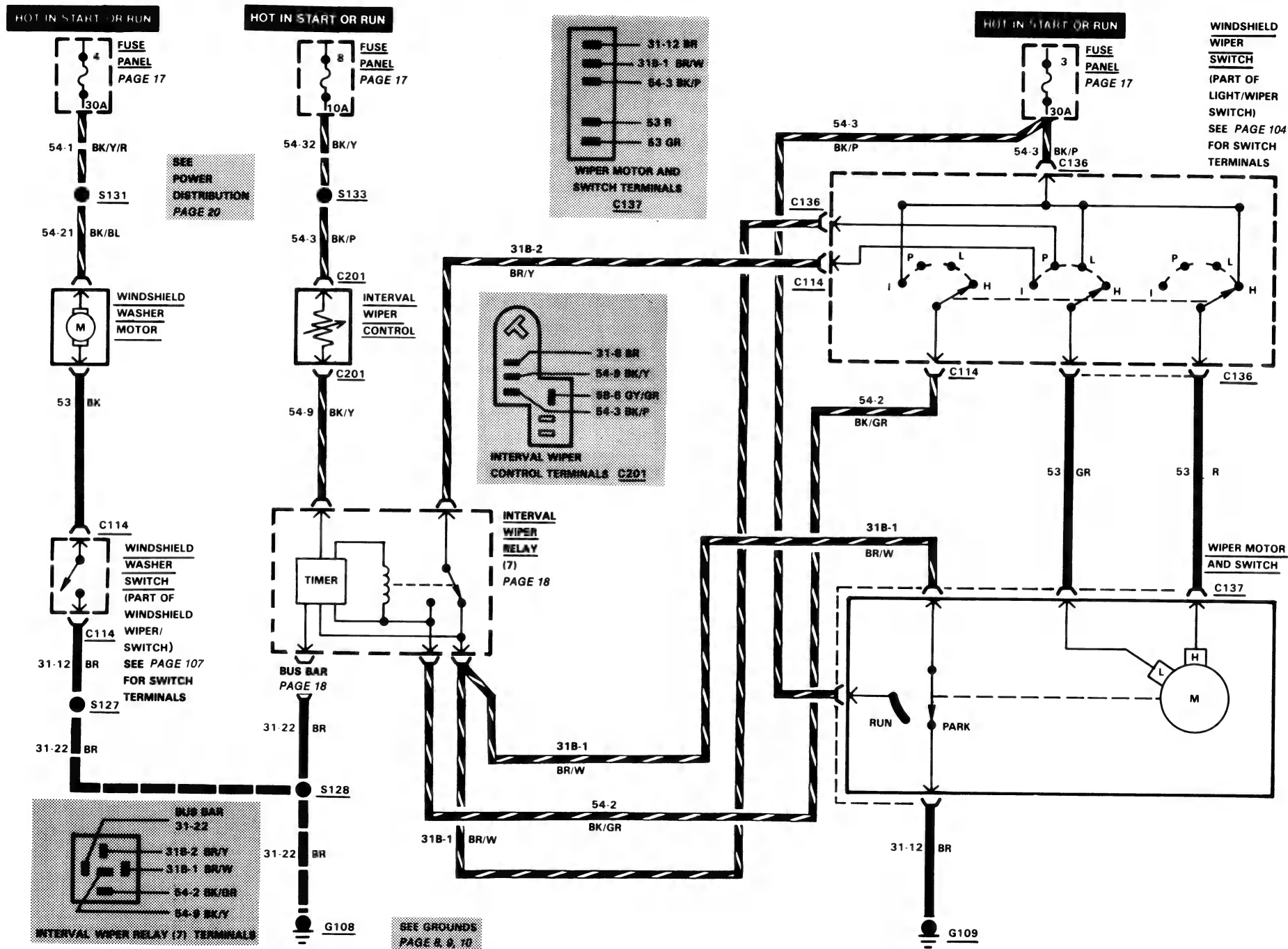


Figure 3—Power Mirror



HOW THE CIRCUIT WORKS

The **Interval Windshield Wiper/Washer** allows the driver to select LO speed, HI speed, or **INTERval** wipe. In **INTERval**, the wipers can be spaced five to twenty seconds apart.

The **Windshield Wiper/Washer Switch** has a momentary washer switch, and a two-position wiper switch. A variable resistor **Interval Wiper Control**, located in the instrument panel, sets interval time.

Washer Operation—Pushing the button on the end of the wiper/washer lever sends current from **Fuse 4** through the washer switch to the **Washer Pump**. If the **Wiper Switch** is in OFF or INT, interval override operates the electronic switch and governor relay to apply power to the L terminal of the wiper motor. The wipers operate in low speed. When the washer lever is released, extra wipe cycles are provided to dry the windshield. The wipers then return to OFF or INT operation.

LO (or HI) Speed Wiper Operation—When the wiper switch is in the LO (or HI) position, current flows from **Fuse 3** to the L terminal of the wiper motor. Power is applied to the H terminal of the wiper motor through the HI position of the wiper switch for high speed operation.

Interval Wiper Operation—During interval operation, the wipers make single wipes at low speed separated by a variable length pause.

When first switched to INT position, current flows through the wiper switch and to the **Interval Wiper Relay** which then activates the relay timer. The timer momentarily closes the electronic switch inside the **Interval Wiper Relay**. Current flows to the wiper motor L terminal through the energized contacts of the relay.

COMPONENT LOCATION

		Page- Figure	Color	Terminals
Interval Wiper Control	On the instrument panel, below the tachometer . .	63-1		
Interval Wiper Relay	In fuse box			
Wiper Motor and Switch . . .	LH side beneath cowl			
Windshield Wiper Switch . .	RH side of steering column	63-1		
Windshield Washer Motor .	LH front fender apron, inside washer fluid reservoir	74-2		
Windshield Washer Switch .	On end of windshield wiper lever	63-1		
Connector C114	RH side of steering column	36-1	BK	8
Connector C136	At windshield wiper switch	36-1	BK	4
Connector C137	At windshield wiper motor		BK	5
Connector C201	At interval wiper switch	74-1	GY	6
Ground G108	LH cowl panel	13-3		
Ground G109	Near wiper motor			
Splice S127	Behind center of I/P	78-1		
Splice S128	Near LH door ajar switch T/O behind I/P	78-1		
Splice S131	Near LH door ajar switch T/O behind I/P	78-1		
Splice S133	Center of I/P near clock			

After the **Interval Wiper Relay** internal timer times out, the relay contacts open, and the wiper motor switch changes from the grounded **PARK** position to the hot **RUN** position. Current now flows through the **BR/W** wire, **RUN** contact of the wiper motor switch and resets the relay timer which opens the electronic switch. The current path continues through the de-energized relay contact to the L terminal of the wiper motor. Wiping continues to the completion of one wipe. The wiper motor switch returns to the **PARK** position contact, power is removed and

the wiper motor stops. After a pause (controlled by the variable resistor inside the **Interval Wiper Control**), the relay timer pulls in the electronic switch inside the relay to start another wipe.

When parking is complete, the wiper motor is braked to a stop by grounding the L terminal through the **Windshield Wiper Switch** and the wiper motor switch. Braking takes place when the wiper motor switch moves to the **PARK** position. The wiper motor L terminal is grounded through the **PARK** contact of the wiper motor switch.

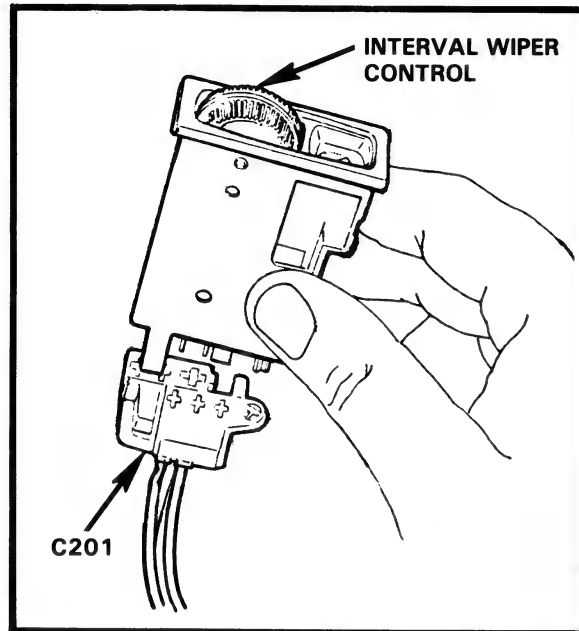


Figure 1—Interval Wiper Control Switch

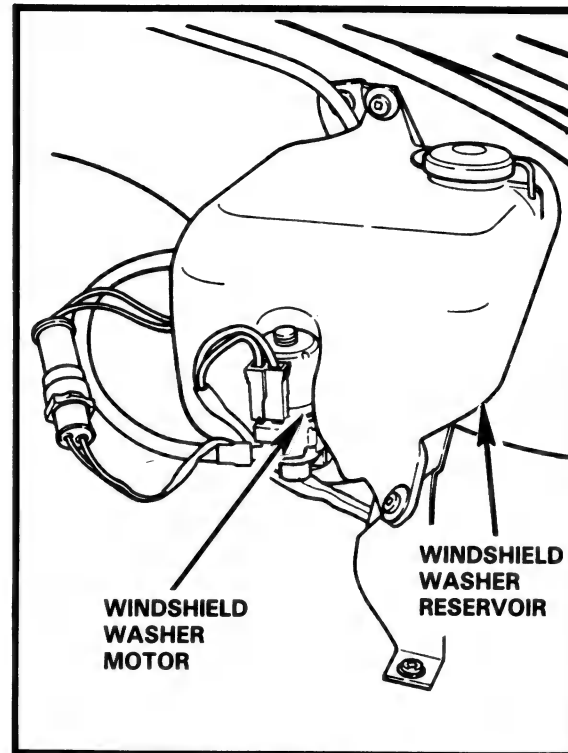


Figure 2—Windshield Washer Pump

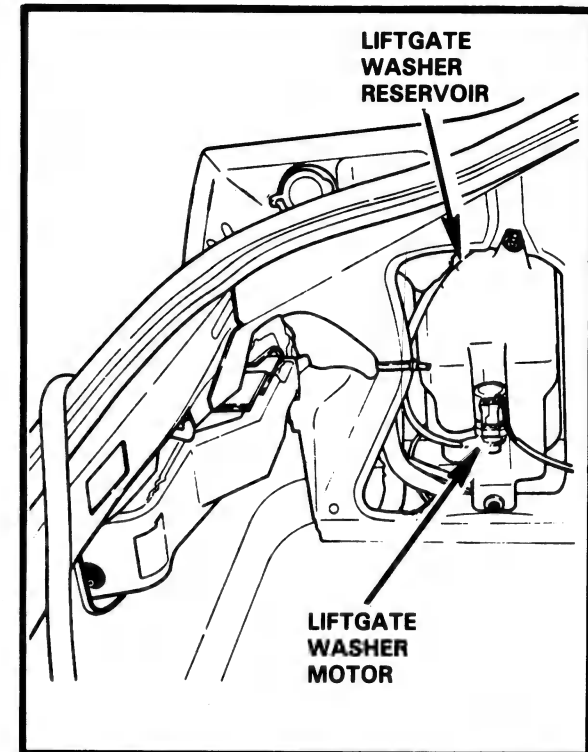


Figure 3—Liftgate Washer Pump

TROUBLESHOOTING HINTS

NO WIPERS IN INTERVAL POSITION

- Separate connector at **Interval Wiper Control** switch. Check at switch for varying resistance between **BK/P** and **BK/Y** wires while turning variable resistor. If bad, replace or repair wiper switch. If good, replace **Interval Wiper Relay**.

WASHER PUMP DOESN'T WORK

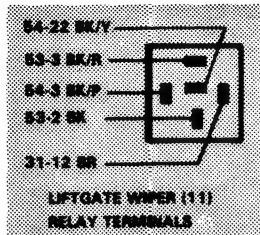
- Check for low fluid level and for damaged hoses. Check **Fuse 4**.
- Disconnect plug at bottom of washer reservoir. Check for voltage on **BK/BL** wire, and for ground on **BK** wire with washer switch closed. Check pump motor, seal, and impeller assembly and replace if bad.

WIPERS DON'T WORK

- Check **Fuse 3**. If fuse blows again, check for short circuit to ground.
Separate **C136**. Carefully check for voltage at **BK/P** wire. If no voltage check for open in **R** wire from **Fuse 3**. If voltage is present, reconnect **C136** and disconnect **C137** and check for voltage at: **R** wire for HI operation. **GR** wire for LO operation.
If voltage is present check ground connection at wiper motor.

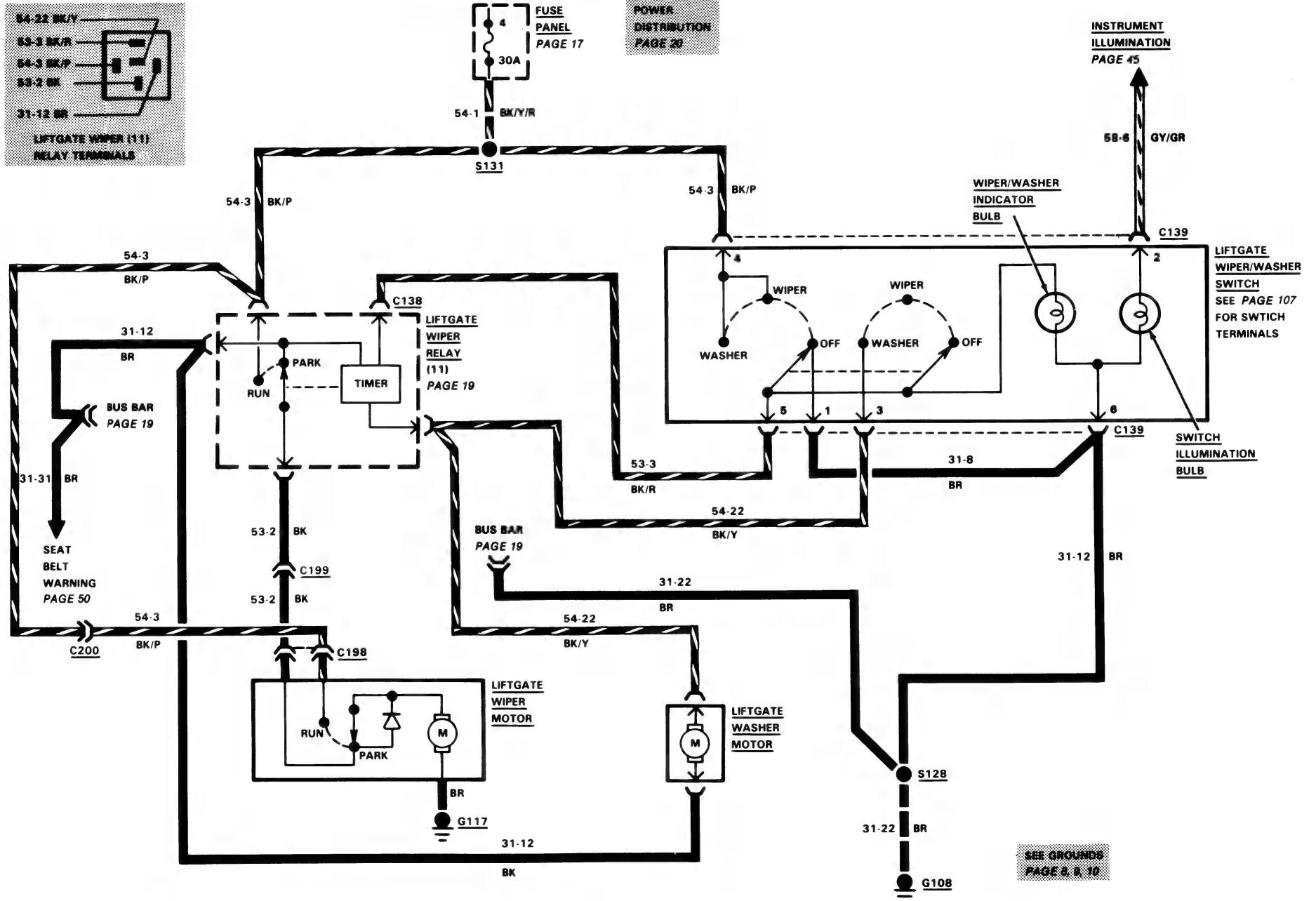
WIPERS RUN BUT DON'T PARK

- Perform "Parking Test—Non-Depressed Park" in Shop Manual Section 35-60.



HOT IN START OR RUN

SEE
POWER
DISTRIBUTION
PAGE 20



76 LIFTGATE WIPER/WASHER

HOW THE CIRCUIT WORKS

With the **Ignition Switch** in START or RUN, power flows through **Fuse 4** and the **Liftgate** to operate the **Liftgate Wiper/Washer**.

Washer Operation

When the wiper/washer switch is depressed to its second position, the **Liftgate Washer Pump** motor is powered. The wiper operates when the washer switch is closed.

Wiper Operation

When the wiper/washer switch is depressed to its first position, current flows to the **Liftgate Wiper Relay**. The timer inside the **Liftgate Power Relay** is started and the contacts close, sending current to the RUN circuit of the **Liftgate Wiper Motor**. After a length of time, the timer opens the contacts inside the relay and current is sent to the PARK circuit of the **Liftgate Wiper Motor**. This cycle repeats itself until the **Liftgate Wiper/Washer Switch** is turned off.

TROUBLESHOOTING HINTS

WIPER DOESN'T WORK

- Check **Fuse 4**.
- Separate **C139**. Check for power on **BK/P** wire with ignition ON.
- Remove **Liftgate Wiper Relay** from **Fuse Panel**. Check for power on **BK/P** wire with ignition and wiper switch on. If power is missing, check wires back to wiper switch. Check for continuity to ground at **BR** wire.
- If continuity OK, test motor as described in Section 35-80 of the Shop Manual.

WASHER DOESN'T WORK

- Separate **C139** from **Liftgate Wiper/Washer Switch**. Check for continuity on **BK/Y** wire from **C139** to **Liftgate Washer Motor**.
- Check continuity of **BR** wire from **Liftgate Washer Motor** to **G108**.

COMPONENT LOCATION

		Page- Figure	Color	Terminals
Liftgate Washer Motor	In reservoir bottle at left side of reservoir	74-3		
Liftgate Wiper Motor	In liftgate	76-1		
Liftgate Wiper Relay	In fuse box (relay II)			
Liftgate Wiper/Washer Switch	Left hand side of the I/P	63-1		
Connector C139	At liftgate wiper/washer switch	13-3	P	6
Connector C198	At liftgate wiper motor	76-1	BK	5
Connector C199	In liftgate			1
Connector C200	In liftgate			1
Ground G108	LH cowl panel	13-3		
Ground G117	At liftgate wiper motor	76-1		
Splice S128	Near LH door ajar switch T/O behind I/P	78-1		
Splice S131	Near LH door ajar switch T/O behind I/P	78-1		

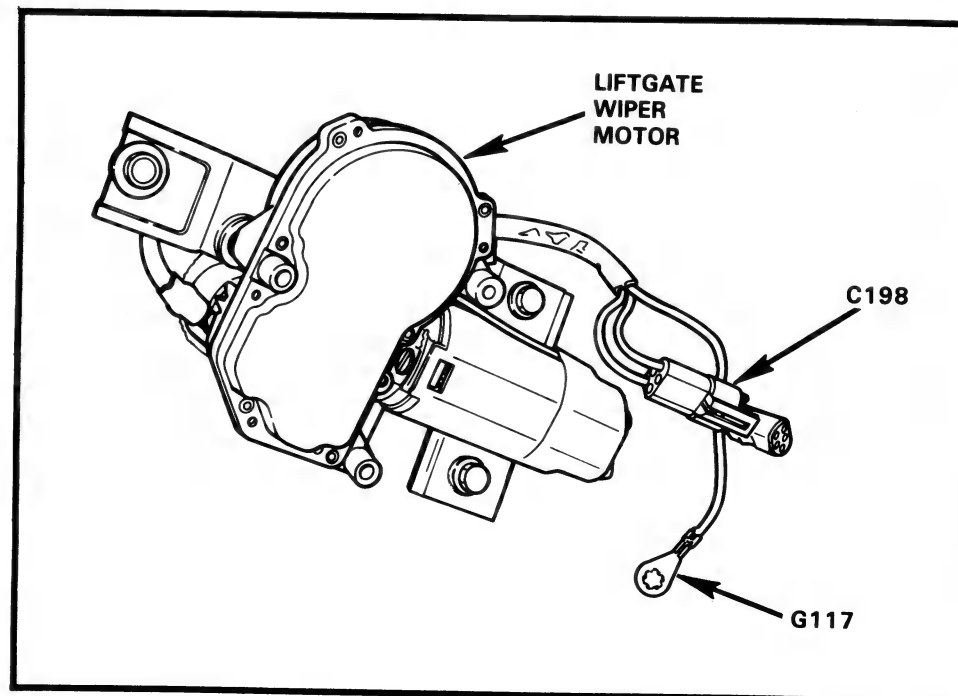
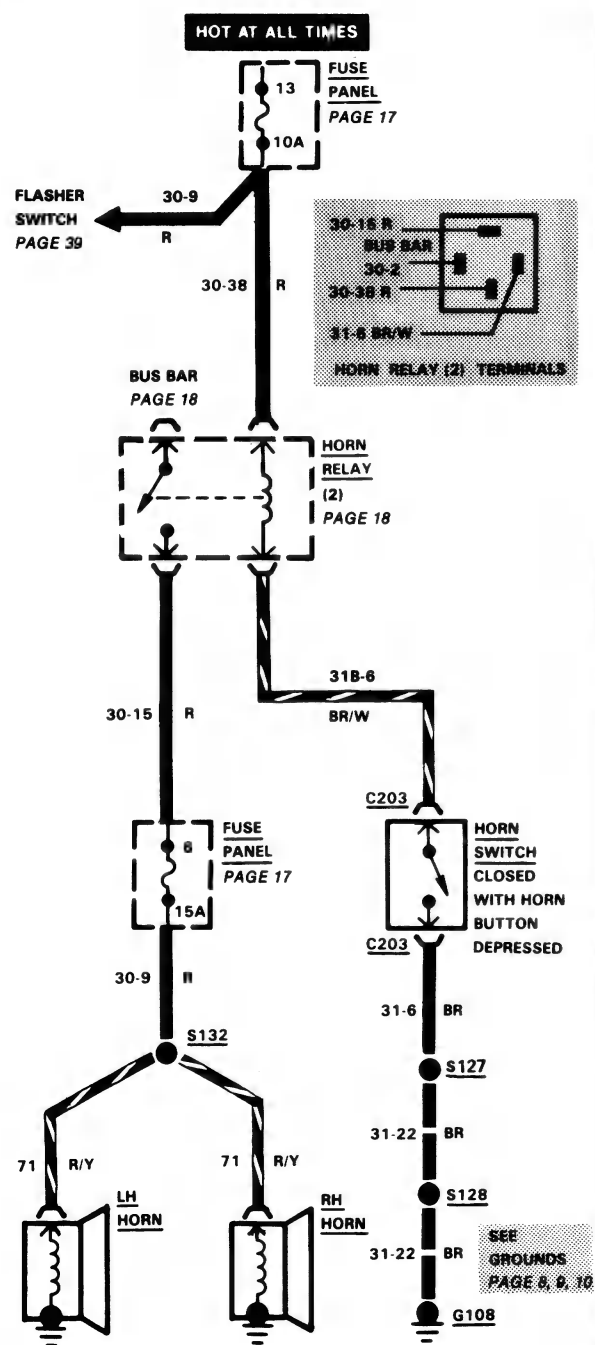


Figure 1 – Liftgate Wiper Motor



COMPONENT LOCATION

		Page- Figure	Color	Terminals
Horns	At front RH and LH side of engine compartment	77-1		
Horn Relay	In fuse panel			
Horn Switch	In steering wheel			
Connector C203	At horn switch	13-3	BK	2
Ground G108	LH cowl panel	13-3		
Splice S127	Behind center of I/P			
Splice S128	Near LH door ajar switch T/O behind I/P			
Splice S132	LH side of engine compartment near horn T/O			

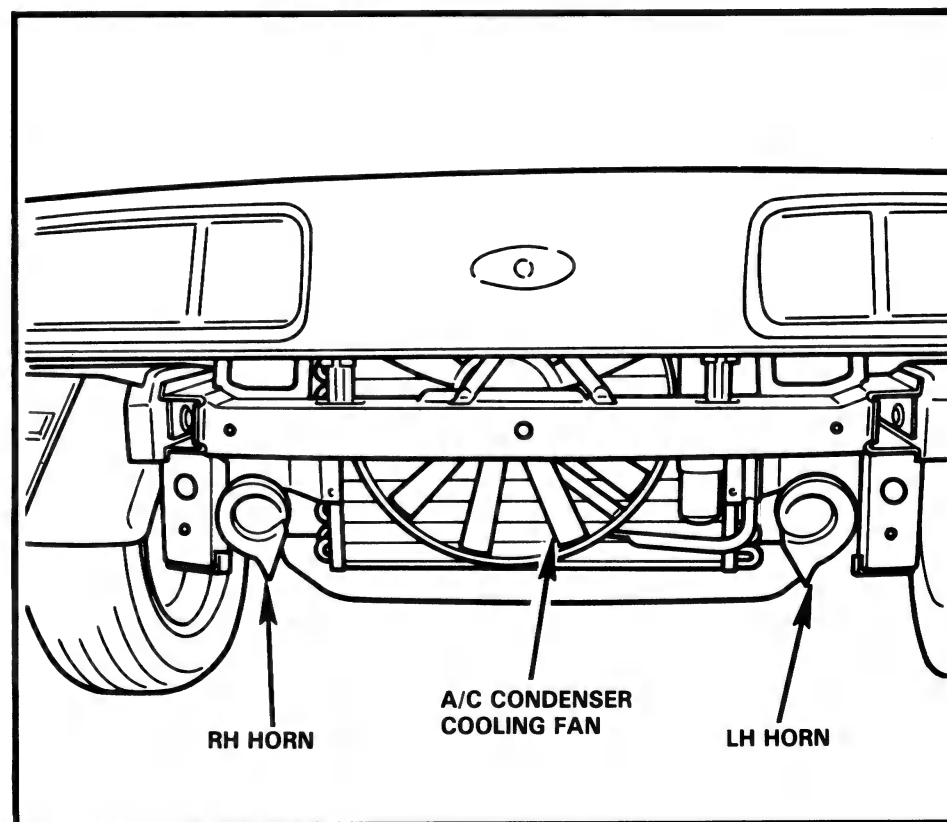
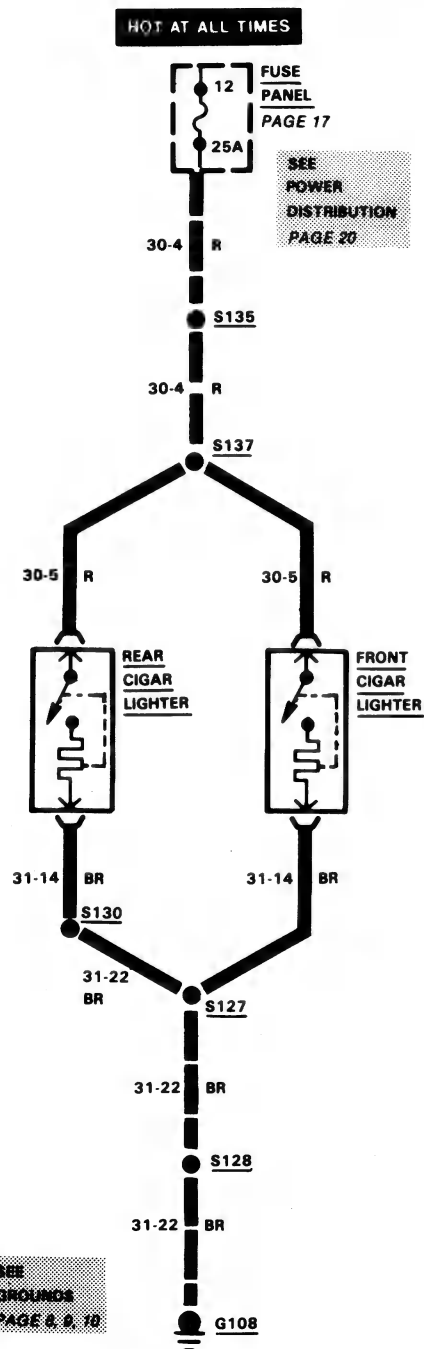


Figure 1 — RH and LH Horns



COMPONENT LOCATION

		Page- Figure	Color	Terminals
Front Cigar Lighter	Bottom center of I/P	63-1		
Rear Cigar Lighter	On the back of the center console			
Ground G108	LH cowl panel	13-3		
Splice S127	Behind center of I/P	78-1		
Splice S128	Near LH door ajar switch behind I/P	78-1		
Splice S135	Near LH door ajar switch T/O behind I/P	78-1		
Splice S137	Behind center of I/P	78-1		

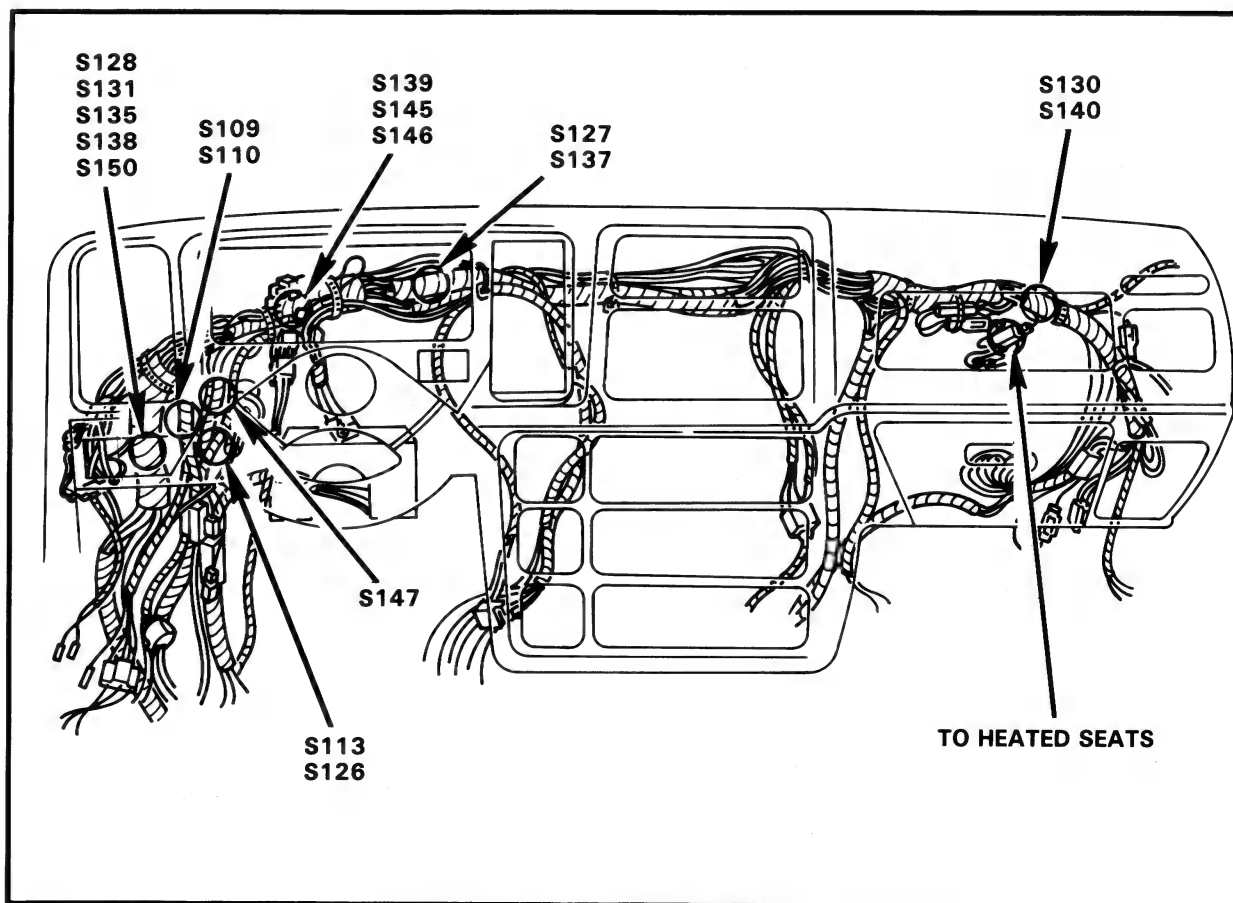
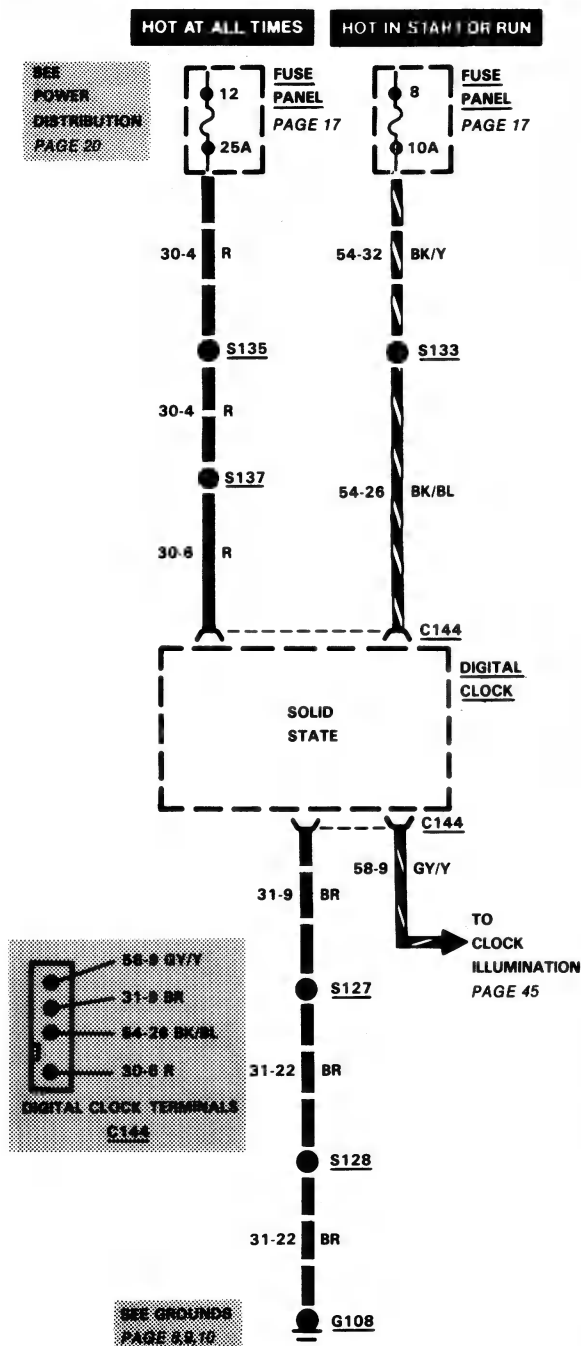


Figure 1 — Instrument Panel Wiring



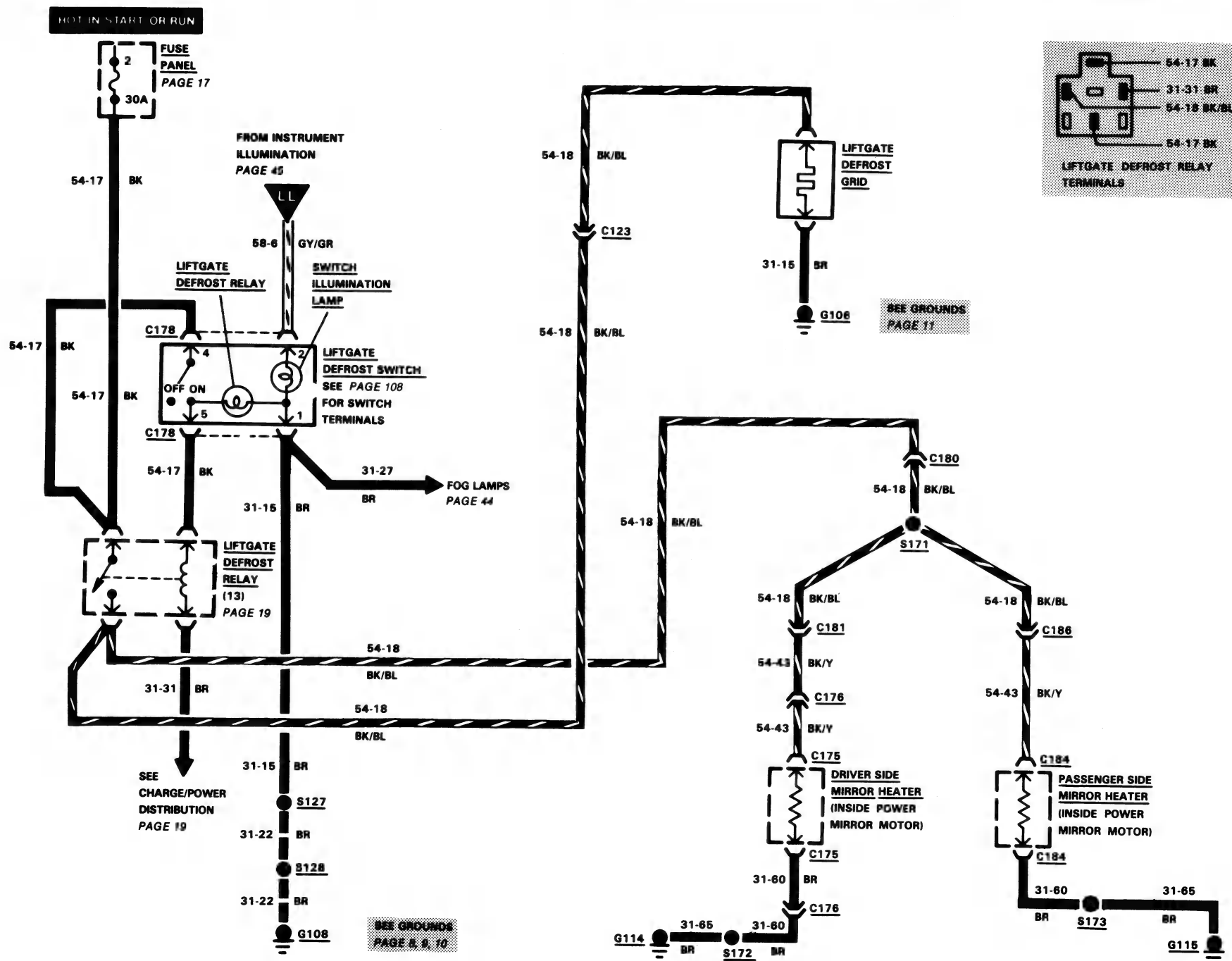
COMPONENT LOCATION

		Page-Figure	Color	Terminals
Digital Clock	Center of I/P	63-1		
Connector C144	At digital clock	55-2	BK	4
Ground G108	LH cowl panel	13-3		
Splice S127	Behind center of I/P	78-1		
Splice S128	Near LH door ajar switch T/O behind I/P	78-1		
Splice S133	Center of I/P, near tripmarker			
Splice S137	Behind center of I/P	78-1		

HOW THE CIRCUIT WORKS

Fuse 12 provides current to operate the electronic digital clock memory circuits. With the **Ignition Switch** OFF, the display is OFF, but the clock still keeps time. When the **Ignition Switch** is in START or RUN, the display lights up with current provided from Fuse 8.

When the **Main Light Switch** is in the park or headlamp position, the display will dim.



HOW THE CIRCUIT WORKS

When the **Liftgate Defrost Switch** is closed, current flows from **Fuse 2** to the **Liftgate Defrost Relay**. The **Defrost Relay** is energized, which closes the contacts and sends current to the **Liftgate Defrost Grid** and **Mirror Grids**. When the **Liftgate Defrost Switch** is opened, the relay is deenergized and the contacts open.

TROUBLESHOOTING HINTS

NO DEFROST OPERATION

- Check that relay operates when switch is turned ON and OFF.
- Check power on circuit 54-17 (BK wire) at switch and relay.
- Check **Fuse 2**.

MIRRORS DO NOT HEAT UP

- If one mirror does not heat up, check circuit 54-43 (BK/Y wire).
- Check mirror heater element for continuity.
- Check for good ground (G114 or G115).

Both mirrors are heated when **Liftgate Defrost Switch** is on.

COMPONENT LOCATION

		Page-Figure	Color	Terminals
Mirror Heater Grid	In the right and left side mirrors			
Liftgate Defrost Grid	In the liftgate window			
Liftgate Defrost Relay				
Liftgate Defrost Switch	On I/P, left of speedometer	63-1		
Connector C123	In liftgate, right of latch		GY	2
Connector C175	At driver side power mirror motor	71-3	BK	5
Connector C176	Inside driver's door		BK	1
Connector C178	At liftgate defrost switch	81-1	N	6
Connector C180	Behind center of I/P		BK	1
Connector C181	Near RH A-pillar	68-2	BK/N	5
Connector C184	At passenger side power mirror motor	71-3	BK	5
Connector C186	In RH door		BK	5
Ground G106	Liftgate panel near latch	12-2		
Ground G108	LH side I/P near foglamp switch T/O	13-3		
Ground G114	Near LH A-pillar	68-1		
Ground G115	Near RH A-pillar	68-2		
Splice S127	Behind center of I/P	78-1		
Splice S128	Near LH door ajar switch T/O behind I/P	78-1		
Splice S171	RH cowl panel			
Splice S172	Inside driver's door			
Splice S173	Inside passenger's door			

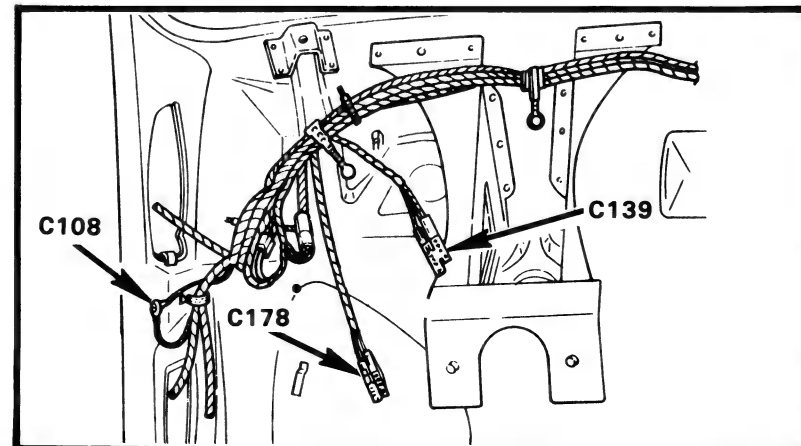
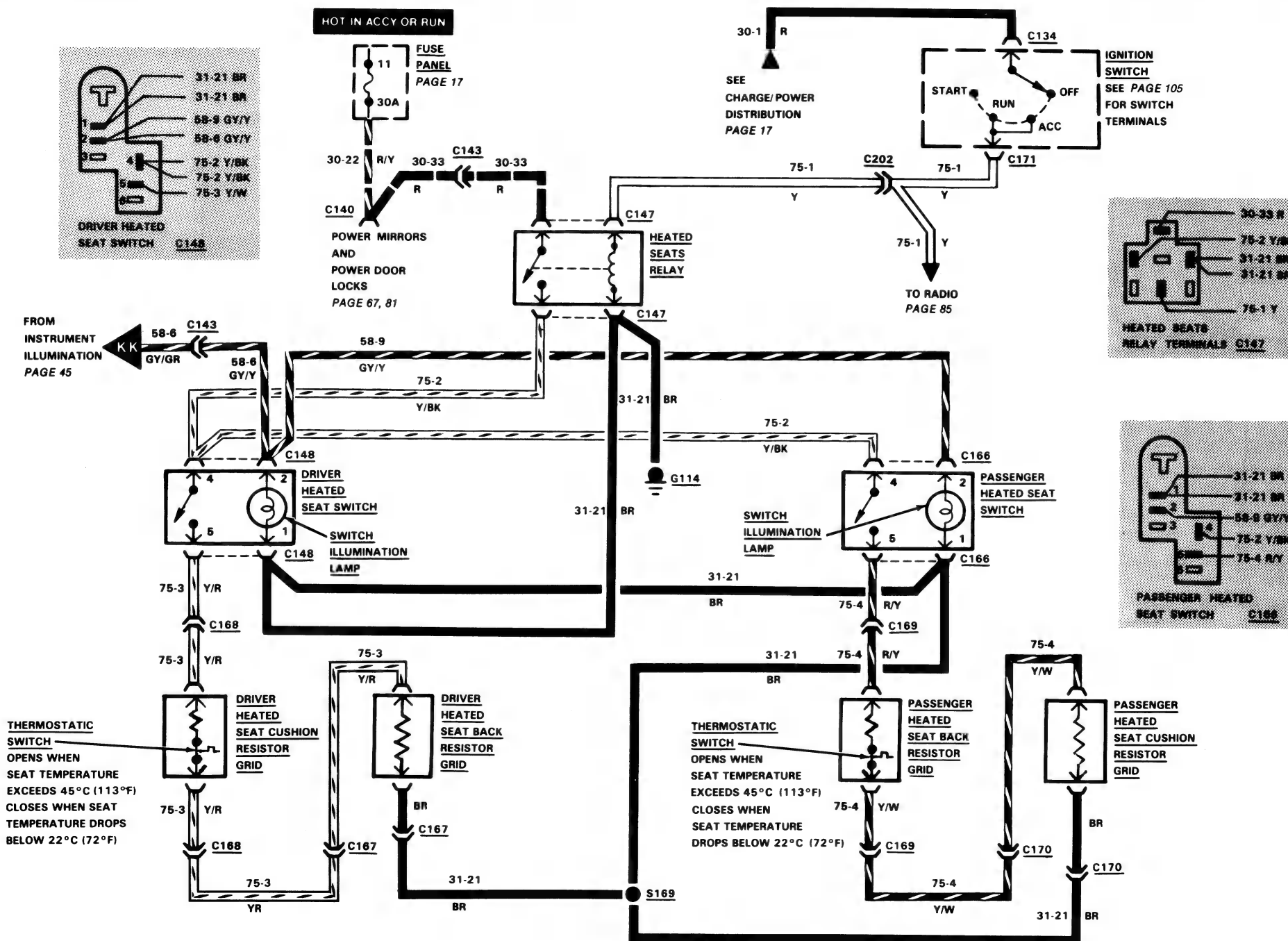


Figure 1 – LH I/P Wiring

82 HEATED SEATS



HOW THE CIRCUIT WORKS

When the **Ignition Switch** is turned to Run or ACC position, current flows to the Heated Seats Relay and energizes the relay coil and closes the relay contacts. Current then flows from **Fuse 11** to the **Driver and Passenger Heated Seat Switches**, when switch is turned on, current flows to the **Resistor Grids** located in the seat back and seat pad. A **Thermostatic Switch** located in each seat pad, opens when seat temperature reaches 45°C (113°F), and closes when it drops below 22°C (72°F).

TROUBLESHOOTING HINTS

NEITHER HEATED SEAT WORKS

- Check for voltage at **Y** wire at **Heated Seats Relay**.
- Check that **G114** is clean and tight.
- With ignition in Run or ACC, check for voltage at **Y/BK** wire of **C148**.

ONE HEATED SEAT DOESN'T WORK

- Check for voltage at **Y/BK** wire of affected seat switch.
- Check **Thermostatic Switch** in seat pad. (Refer to Shop Manual for Testing Procedure.)

COMPONENT LOCATION

		Page-Figure	Color	Terminals
Thermostatic Switch	Inside seat cushion	83-3		
Heated Seat Relay	In steering column support			
Ignition Switch				
Driver and Passenger Heated Seat Switch	Located on the right and left respectively of the center console	83-1,2		
Heated Seat Back Resistor				
Heated Seat Cushion Resistor			BK	2
Connector C134	Behind lower center of I/P, near console			4
Connector C140	At steering column to ignition switch	13-3,26-6	BR	6
Connector C143	Behind LH side of I/P	68-1	R	2
Connector C147	Behind RH side of I/P	68-1	BK	2
Connector C148	At heated seats relay on steering column support		BK	4
Connector C166	At driver heated seat switch	84-4	O	6
Connector C167	At passenger heated seat switch	84-4	O	6
Connector C168	At driver seat back	83-1	BK	2
Connector C169	At driver seat pad	83-1	RED	2
Connector C170	At passenger seat pad	83-2	RED	2
Connector C171	At passenger seat back	83-2	BK	2
Connector C202	At seat belt switch	26-6	GY	2
Ground G114	Behind LH side of I/P		Y	1
Splice S169	Near LH A-pillar	68-1		
	Beneath center console, behind shifter			

84 HEATED SEATS

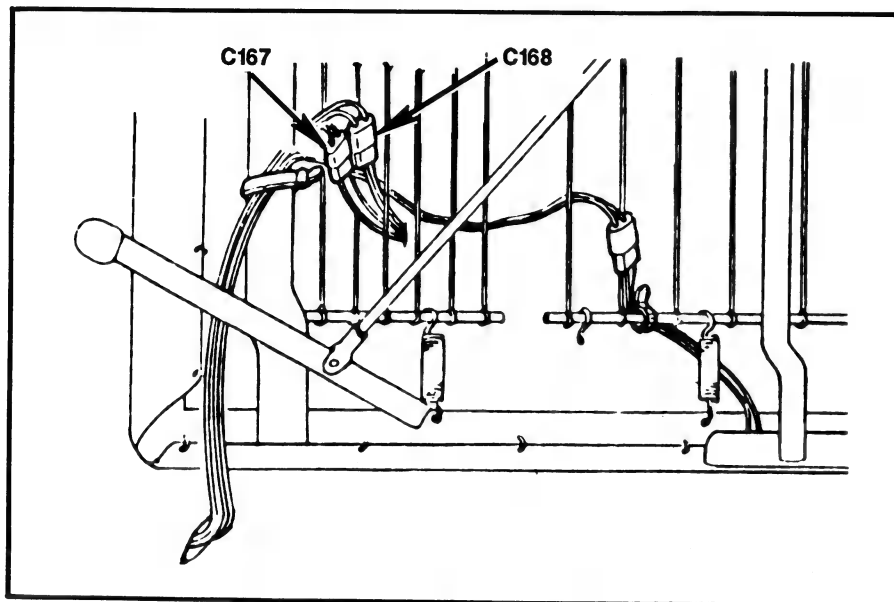


Figure 1—Drivers Seat Connectors

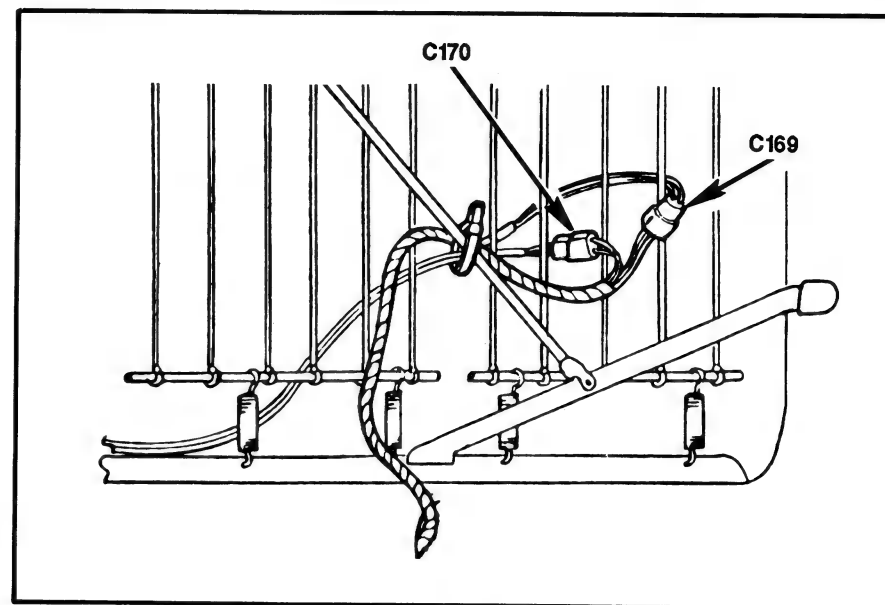


Figure 2—Passenger Seat Connectors

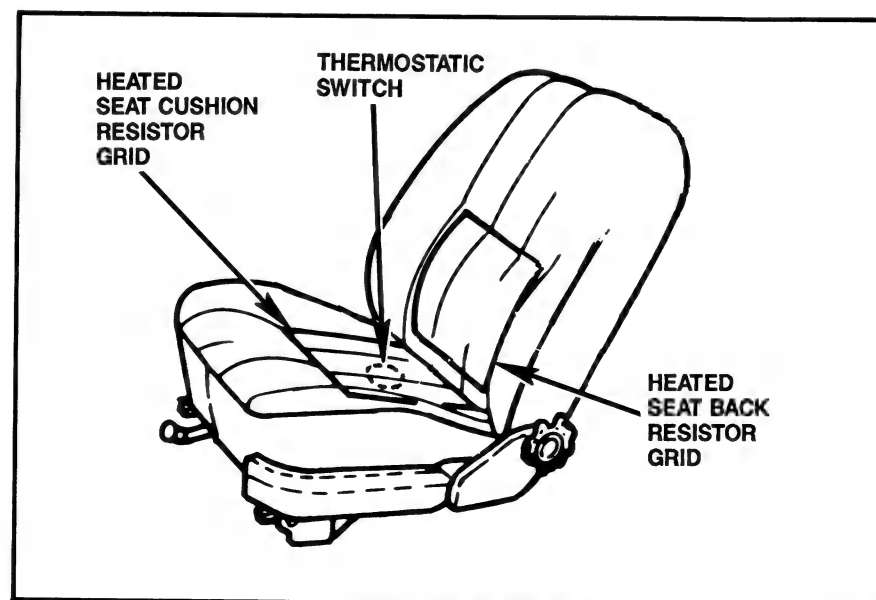


Figure 3—Heated Seats

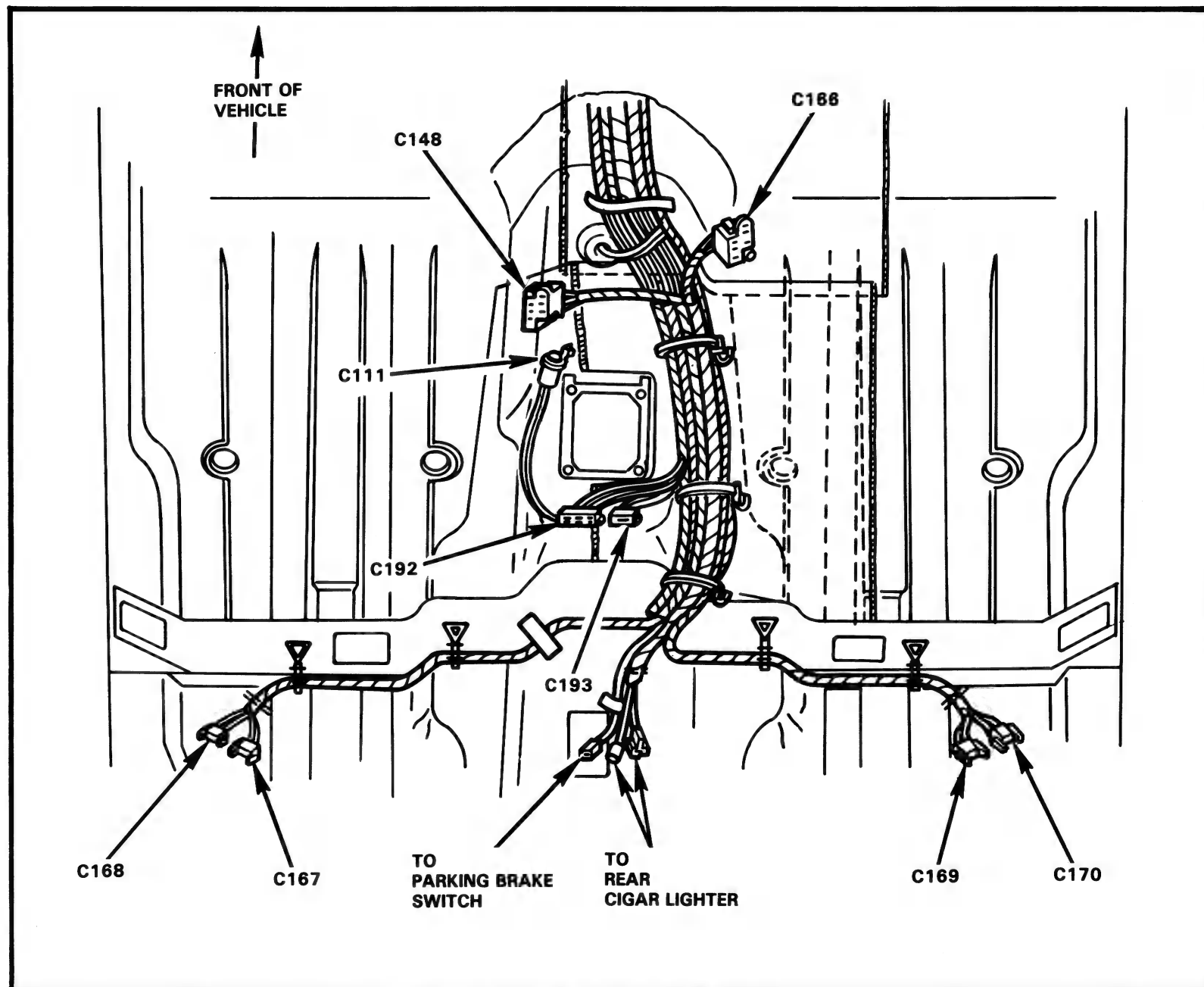
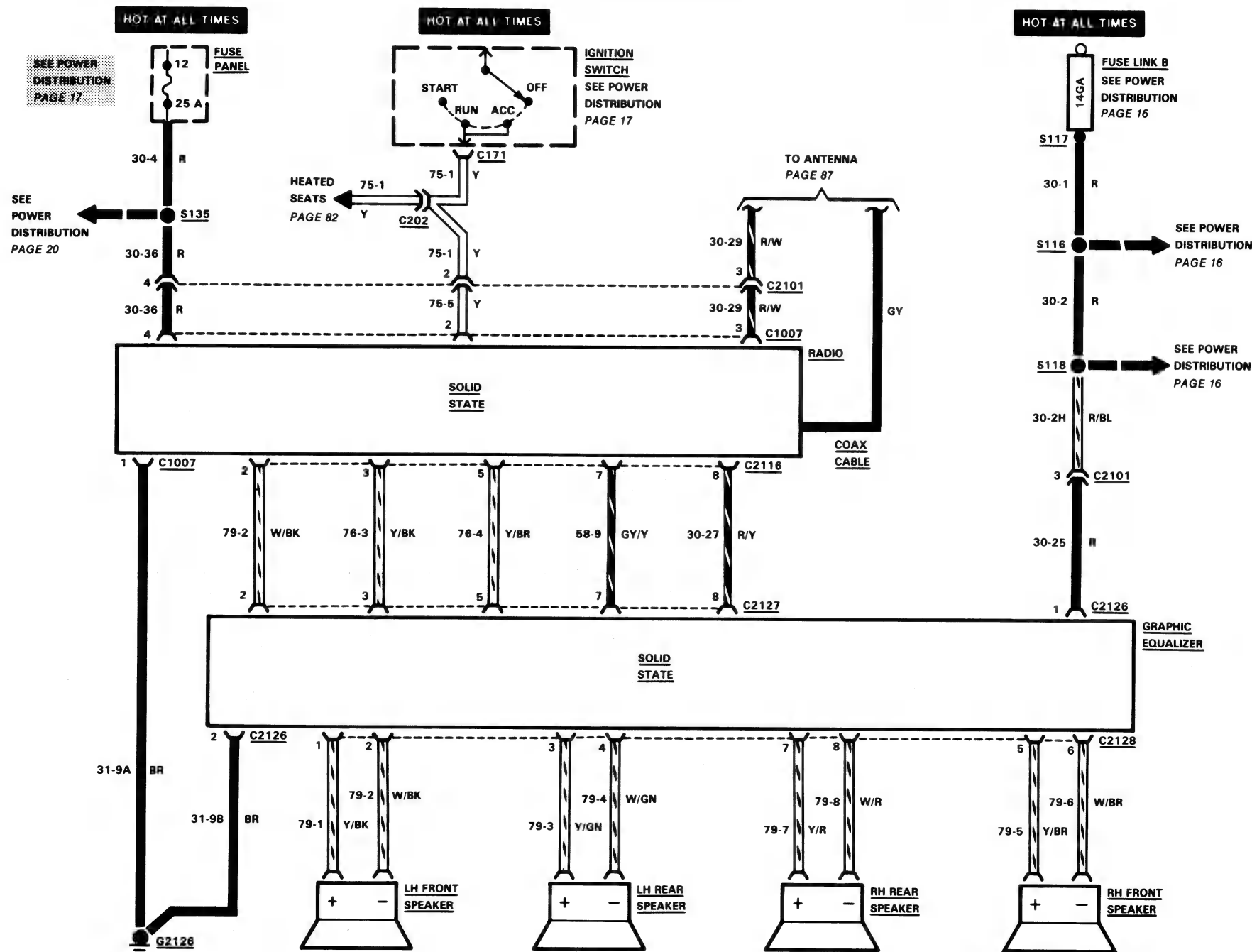
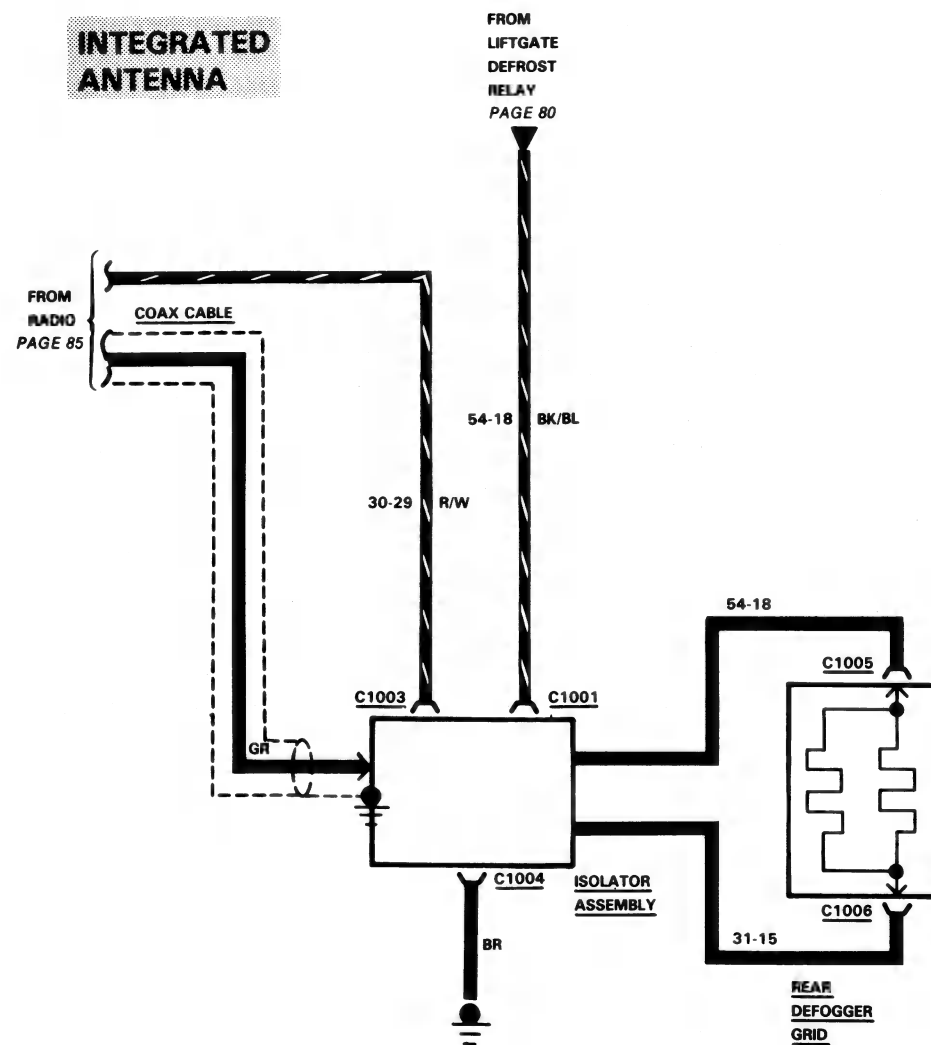


Figure 4—Console and Heated Seats Wiring

86 RADIO (WITH GRAPHIC EQUALIZER)





POOR RECEPTION AM AND/OR FM

- Check **Antenna Cable** by substitution of a known good cable.
- Check **Antenna Ground** (Power Antenna only).
- Check for power at **Heated Backlight Isolator Assembly** (heated backlight antenna only) at **Connector C1003** (light gauge wire) with **Radio** turned ON and **Ignition** in ACC position.
- Check heated backlight grid for a crack or break in element pattern.

COMPONENT LOCATION

		Page-Figure	Color	Terminals
Ignition Switch	On steering column			
Front Speakers	In either side of the I/P	63-1		
Rear Speakers	In either side of the rear quarter trim panel			
Connector C134	At steering column to ignition switch	13-3,26-6	BR	6
Connector C163	At radio			2
Connector C164	At radio			2
Connector C171	At ignition switch	26-6		1
Connector C202	Behind LH side of I/P		Y	1
Connector C1001	At isolator assembly			1
Connector C1003	At isolator assembly			1
Connector C1005	At rear defogger grid (feed)			1
Connector C1006	At rear defogger grid (ground)			1
Connector C1007	At radio			4
Connector C1008	Behind I/P near steering column			
Connector C1009	At antenna assembly			2
Splice S116	RH front of engine compartment			
Splice S118	LH side of I/P, near foglamp switch			
Splice S119	Near ignition switch T/O			
Splice S135	Near LH door ajar switch T/O behind I/P	78-1		
Splice S137	Behind center of I/P	78-1		
Splice S149	Near RH tail lamp			

HOW THE CIRCUIT WORKS

The **Radio** receives current directly from the **Ignition Switch**. **Radio** memory circuits receive battery voltage at all times from fuse 12 located in the fuse panel.

The **Graphic Equalizer** receives battery voltage at all times from **Fuse Link B**. Both **Radio** and **Graphic Equalizer** are wired to **Ground G2126**.

TROUBLESHOOTING HINTS

RADIO DOESN'T WORK

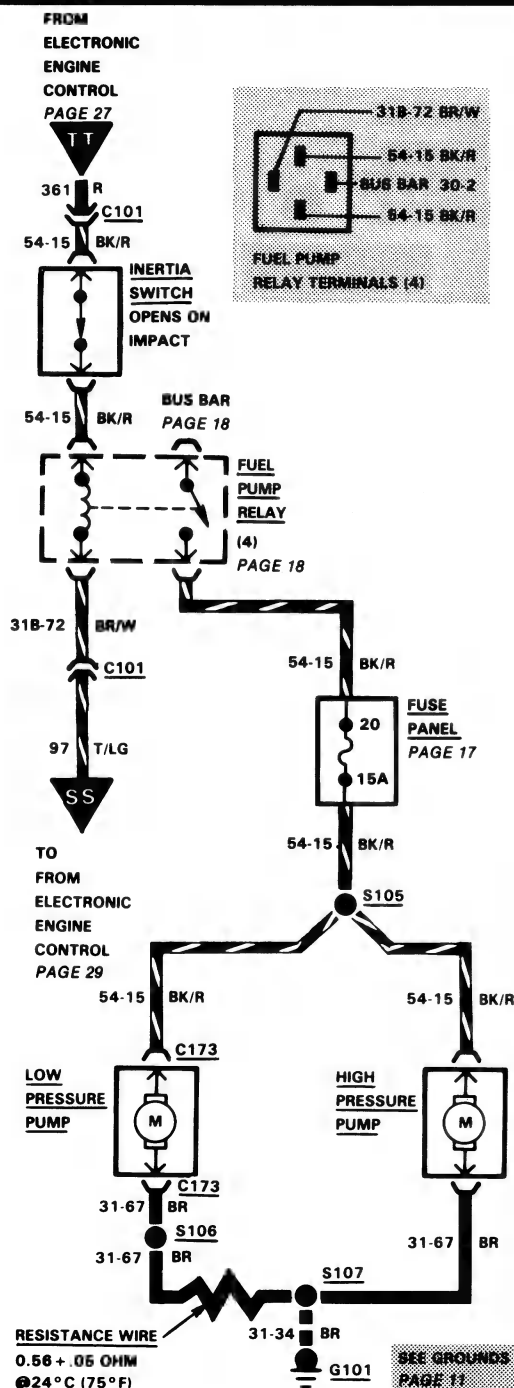
- Check **Fuse 12**.
- Check **Radio** and **Graphic Equalizer** feed circuits.
- Check **Radio** and **Graphic Equalizer** ground circuits.
- Substitute **Radio** and/or **Graphic Equalizer** with known good components.

ONE OR MORE SPEAKERS DON'T WORK

- Substitute speaker(s) with known good speaker(s).
- Check continuity of speaker wires.
- Substitute **Radio** and/or **Graphic Equalizer** with known good components.

COMPONENT LOCATION

		Page-Figure	Color	Terminals
Fuse Link B	At starter solenoid	26-4		
C171	At ignition switch	26-6		1
C202	Behind LH side of I/P		Y	1
C1007	At radio			
C2101	Behind radio			
C2116	At radio			
C2126	At graphic equalizer			
C2127	At graphic equalizer			
C2128	At graphic equalizer			
C2126	At radio mounting bracket			
S116	RH front of engine compartment			
S118	LH side of IP near foglamp switch			
S135	Near T/O to LH door ajar switch			



COMPONENT LOCATION

		Page-Figure	Color	Terminals
Fuel Pump Relay	In fuse panel			
Inertia Switch	In spare tire well	90-1		
In-Line Fuse	LH cowl			
High Pressure Fuel Pump	Mounted to LH frame rail			
Low Pressure Fuel Pump	In fuel tank			
Connector C101	Behind RH cowl panel	34-4	GY	3
Connector C173	At fuel sender		BK	3
Ground G101	Near license lamps			
Splice S105	Near inertia switch	42-2		
Splice S106	Near fuel sender T/O	42-2		
Splice S107	LH rear panel, near tail lamp			

HOW THE CIRCUIT WORKS

Current to operate the Fuel Pumps flows through Fuse Link B. When controlled by the Electronic Control Assembly, and with the Inertia Switch closed, the Fuel Pump Relay operates through the Inertia Switch, applying power to the Fuel Pumps.

NOTE

If engine does not operate after collision, it is possible that the inertia switch (located in the rear center of the spare tire well) has opened. The switch can be reset by pushing down on the white reset plunger.

Current to the Low Pressure Fuel Pump passes through a ballast Resistance Wire, and this pump, mounted in the fuel tank, pumps fuel at low pressure. Fuel pressure is boosted by the High Pressure Fuel Pump, which is mounted to the frame rail.

TROUBLESHOOTING HINTS

FUEL PUMP DOESN'T OPERATE

- Check Fuse Link B. See power distribution.
- Check that G101 is clean and tight.
- Check operation of Fuel Pump Relay.
- Check continuity through Inertia Switch.

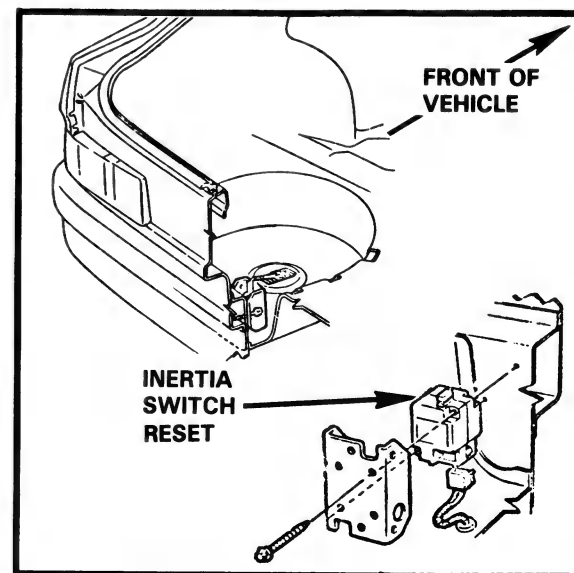
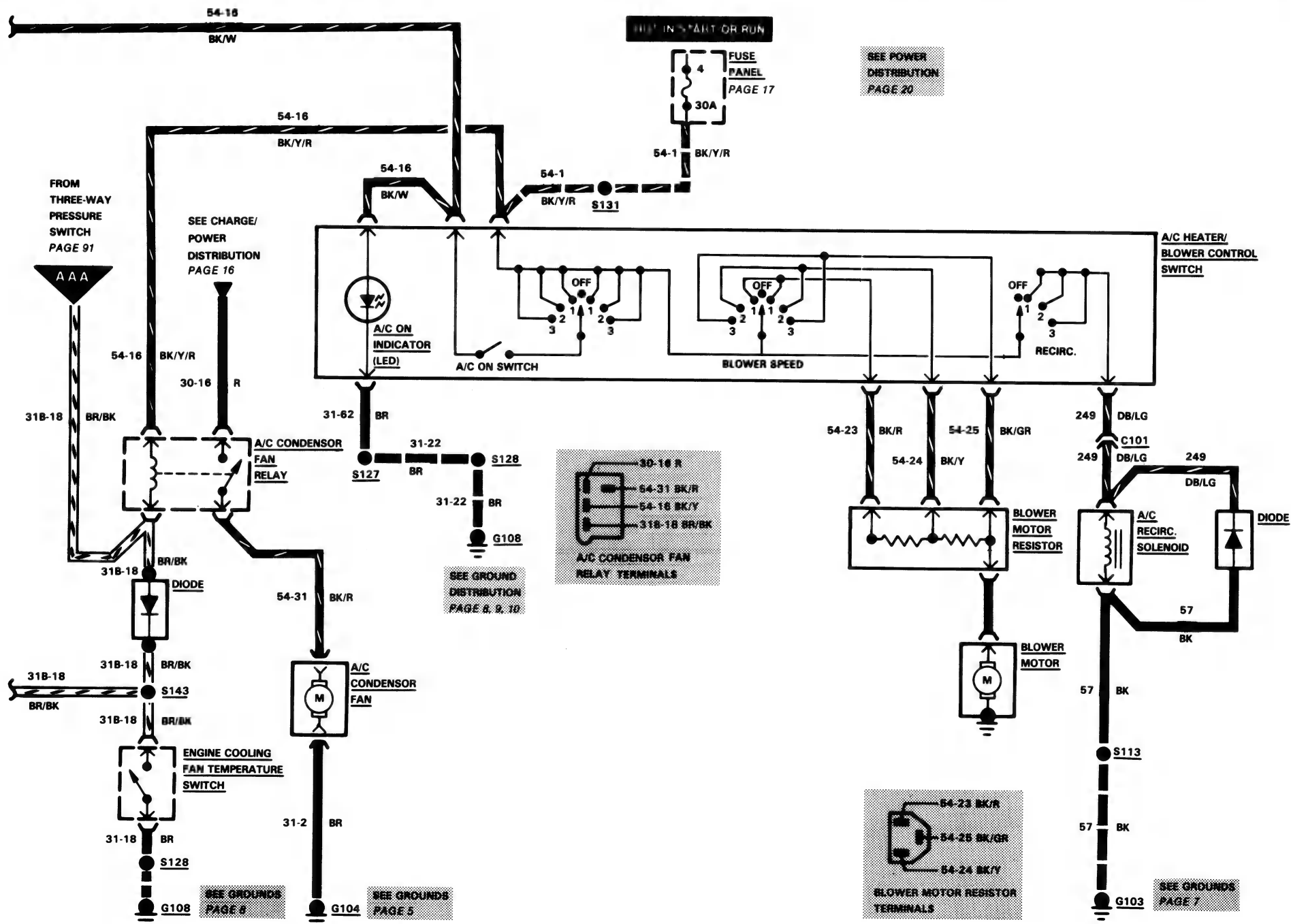


Figure 1 — Inertia Switch





HOW THE CIRCUIT WORKS

A/C—HEATER

Pushing the rotary switch once automatically illuminates a green A/C indicator LED and sends current to the **A/C Compressor Clutch Circuit**. A second push turns the A/C off.

Rotating the switch clockwise over the three blower speed positions directs outside air into the vehicle. Rotating the switch counterclockwise, also over the three positions, circulates recirculated air around the vehicle interior.

A/C-HEATER/COOLING FAN

The **A/C Clutch** is energized with the **A/C On Switch** closed and the **Blower Switch** in any position but **Off**. The clutch operation is controlled in one of three ways.

The first control is the **A/C WOT Cutout Relay**. If the throttle is moved to a wide open throttle (WOT) position, a ground signal from the EEC IV module is provided to the **WOT Relay**. This energizes the relay, cutting off power to the **A/C Clutch**.

The second control is the **A/C Deicing Switch**. If the temperature of the A/C evaporator drops too low, the **A/C Deicing Switch** is de-energized until the temperature of the evaporator rises. With the relay de-energized, power to the **A/C Clutch** is cut off.

The third control is the MIN/MAX side of the **Three-Way Pressure Switch**. If the A/C system pressure goes too high (max) or drops too low (min) the affected switch will open cutting off power to the **A/C Clutch**.

While the **A/C Clutch** is energized, a signal through circuit 347 BK/Y is sent to the EEC IV module. This signal causes the EEC IV module to increase engine idle speed to compensate for the extra load from the operation of the **A/C Clutch**.

COMPONENT LOCATION

		Page- Figure	Color	Terminals
A/C Clutch Field Coil	At A/C compressor			
A/C Compressor Clutch Relay	In fuse box			
A/C Condenser Cooling Fan	In front of condenser	77-1		
A/C Condenser Cooling Fan Relay	Near windshield washer bottle			
A/C Deicing Switch	In evaporator case in cowl panel			
A/C Heater Blower Control Switch	Center of I/P, left of radio			
A/C Pressure Switch	On top of receiver/dryer	94-3		
A/C Solenoid	RH fender apron near battery	33-2		
A/C W.O.T. Cutout Relay	In fuse panel			
Engine Cooling Fan	Between radiator and engine	94-1		
Engine Cooling Fan Relay	Near windshield washer bottle			
Engine Cooling Fan Temperature Switch	LH side of engine on lower intake manifold	94-1		
Heater Blower Motor	Inside the evaporator case	94-2		
Connector C109	Near windshield washer bottle		N	2
Connector C101	Behind RH side of I/P	34-4	BK	6
Connector C156	At heater blower switch	55-2	BK	8
Connector C209	At heater blower switch	55-2	BK	1
Connector C210	At heater blower switch	55-2	BK	1
Ground G103	RH side of engine compartment			
Ground G104	RH side engine compartment near parking lamp	21-1		
Ground G105	Near LH flasher T/O	12-1		
Ground G108	LH cowl panel	13-3		
Splice S113	RH front of engine compartment	78-1		
Splice S115	LH side of engine compartment near horn T/O			
Splice S127	Behind center of I/P	78-1		
Splice S128	Near LH door ajar switch T/O behind I/P	78-1		
Splice S131	Near liftgate wiper switch T/O behind I/P	78-1		
Splice S143	Behind LH side of kick panel	13-3		
Splice S176	Near A/C deice switch T/O			

ENGINE COOLING FAN

The **Engine Cooling Fan Motor** is operated when the engine temperature is high. The **Engine Cooling Fan Temperature Switch** closes, energizing the **A/C Pressure/Temperature Relay**. This energizes the **Engine Cooling Fan Relay** allowing current to flow to the **Engine Cooling Fan Motor**. This can occur with or without the Ignition Switch in RUN.

The **Engine Cooling Fan Motor** is also operated with the **Blower Switch** in any position except OFF if the A/C ON switch is on. Current flows from **Fuse 4** through the blower switch through circuit 54-16 BK/W to the **Engine Cooling Fan Motor Relay**. The relay is energized and the **Cooling Fan Motor** operates.

A/C CONDENSOR FAN

The **A/C Condenser Fan** also is operated when the **Engine Cooling Fan Temperature Switch** is closed. However, the Ignition Switch must be in Starter RUN.

The **A/C Condenser Fan** also can be operated if the A/C system pressure is high. The HI switch in the three-way pressure switch closes providing a ground path to energize the **A/C Condenser Fan Relay** with turns on the **A/C Condenser Cooling Fan**.

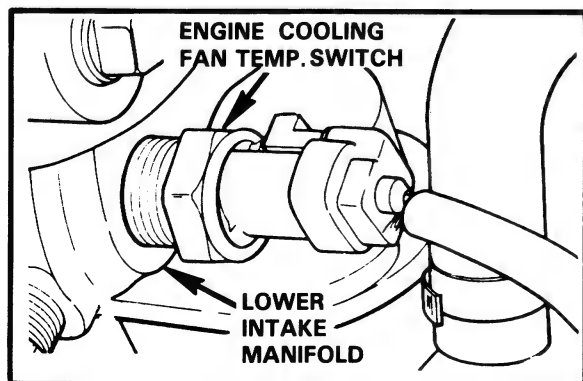


Figure 1—Engine Cooling Fan Temperature Switch

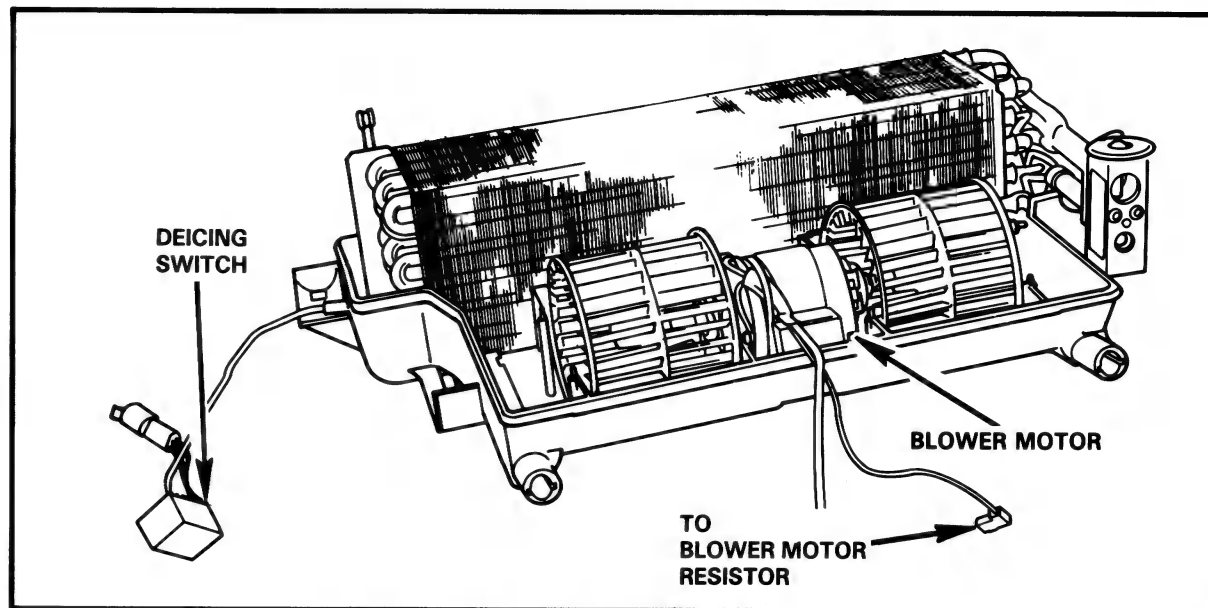


Figure 2—Blower Motor

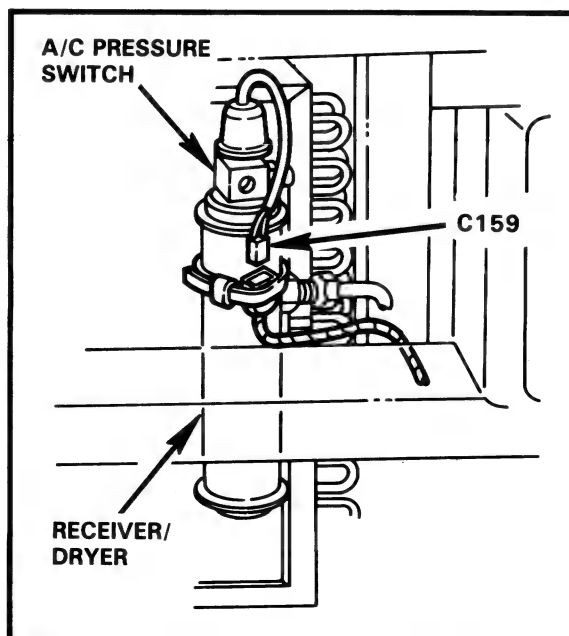


Figure 3—A/C Pressure Switch

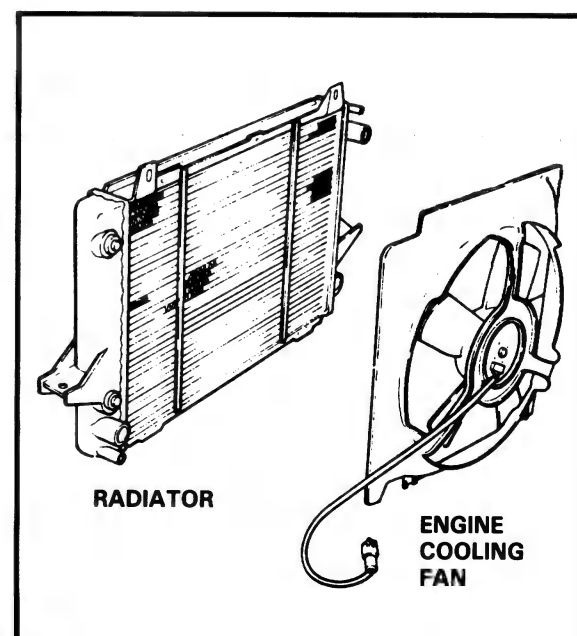
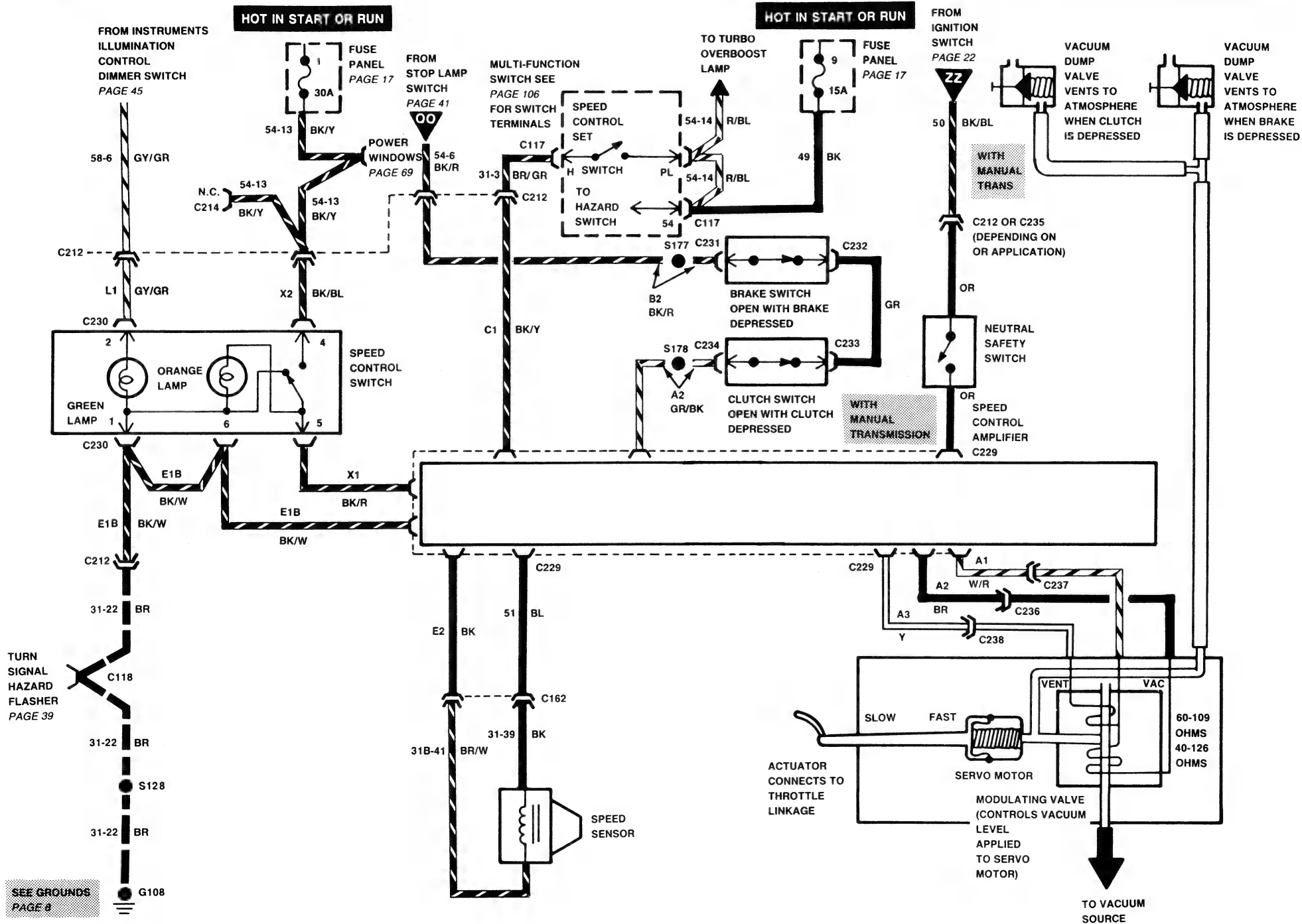


Figure 4—Radiator/Cooling Fan Assembly





HOW THE CIRCUIT WORKS

The **Speed Control Amplifier** controls vacuum to the **Speed Control Servo** motor through the modulating valve. The servo motor moves the throttle through the **Actuator** cable.

To operate the **Speed Control System**, the engine must be running and the vehicle speed higher than 30 mph. The system is activated by pressing the ON switch of the **Speed Control Switch Assembly**.

Pressing and releasing SET sends a command to hold the present speed. This speed is now the set speed. The **Speed Sensor** sends signals to the **Speed Control Amplifier**. These signals tell the amplifier to increase or decrease the vacuum at the servo motor to keep the vehicle at the set speed.

Pressing OFF turns the system off (grounds BK/R wire). The system is also turned off when the brake pedal is depressed (no power through BR/BK wire) or the **Ignition Switch** is turned OFF. The **Vacuum Dump Valve** also operates when the brake pedal is depressed. This is a backup device to release the servo. In vehicles with manual transmission, the **Clutch Switch** opens when the clutch pedal is depressed and turns off the system.

There are two different types of **Speed Control** amplifiers used. The difference between the two is the wiring connectors at the amplifier — one system has two card-type wiring connectors, and the other has a single pin-type connector. Before troubleshooting the system verify which system is used, there are minor wiring differences between the two systems.

TROUBLESHOOTING HINTS SYSTEM DOES NOT OPERATE

- Check power window operation, or Fuse 1.

COMPONENT LOCATION

		Page- Figure	Color	Terminals
Brake Switch	Near top of brake pedal	99-1		
Clutch Switch	Near top of clutch pedal	99-1		
Speed Control Amplifier ..	LH cowl panel	98-1		
Speed Control Servo	Near LH shock tower	98-1		
Speed Control Set Switch ..	Part of multifunction switch	98-2		
Speed Control Switch	LH side of I/P	99-2		
Speed Sensor	On dash behind cluster (early production module only)	98-1		
	In engine compartment near the brake master cylinder.			
Connector C117	At multifunction switch	13-3,	BK	10
Connector C162	At speed sensor	98-1	BL	2
Connector C212	Behind LH side of I/P	98-1	BR	6
Connector C228	At speed control amplifier	98-1		6
Connector C229	At speed control amplifier	98-1		9, 17
Connector C230	At speed control switch	98-1		6
Connector C231	At brake switch	99-1		1
Connector C232	At brake switch	99-1		1
Connector C233	At clutch switch	99-1		1
Connector C234	At clutch switch	99-1		1
Connector C235	Behind LH side of I/P	99-1		1
Connector C236	At speed control servo	98-1		1
Connector C237	At speed control servo	98-1		1
Connector C238	At speed control servo	98-1		1
Ground G108	LH cowl panel	13-3		
Splice S128	Near LH door ajar switch T/O			
Splice S177	Near brake switch			
Splice S178	Near clutch switch			

- Inspect system for broken wires or damaged hoses. Be sure **Speed Control Servo** and throttle linkage operate freely without binding. The **Actuator Cable** must be adjusted to be as tight as possible with holding the throttle open.
- Disconnect **C229** at **Speed Control Amplifier**. Check for battery voltage on **BK/R** wire when speed control switch is turned on.

Check for ground on **BK/W** wire.

- Disconnect **C228** or **C229** (depending on system) at **Speed Control Amplifier**. Check for battery voltage at **BK/Y** wire when SET button is pressed.
- Check operation of **Vacuum Dump Valves** and **Clutch Switch**.
- Read "Speed Control Circuit Diagnosis" in Section 37 of Shop Manual.

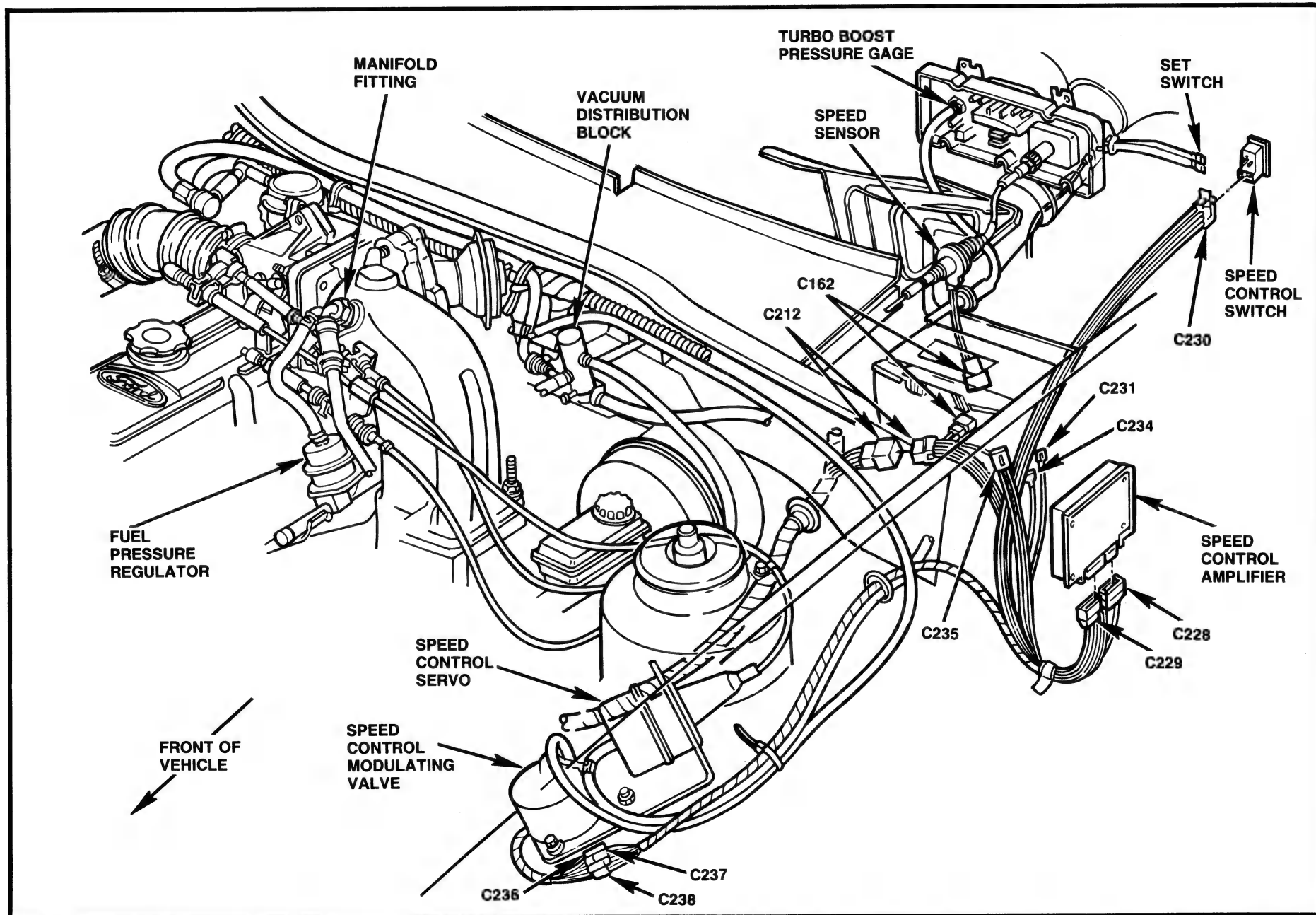


Figure 1 — Speed Control

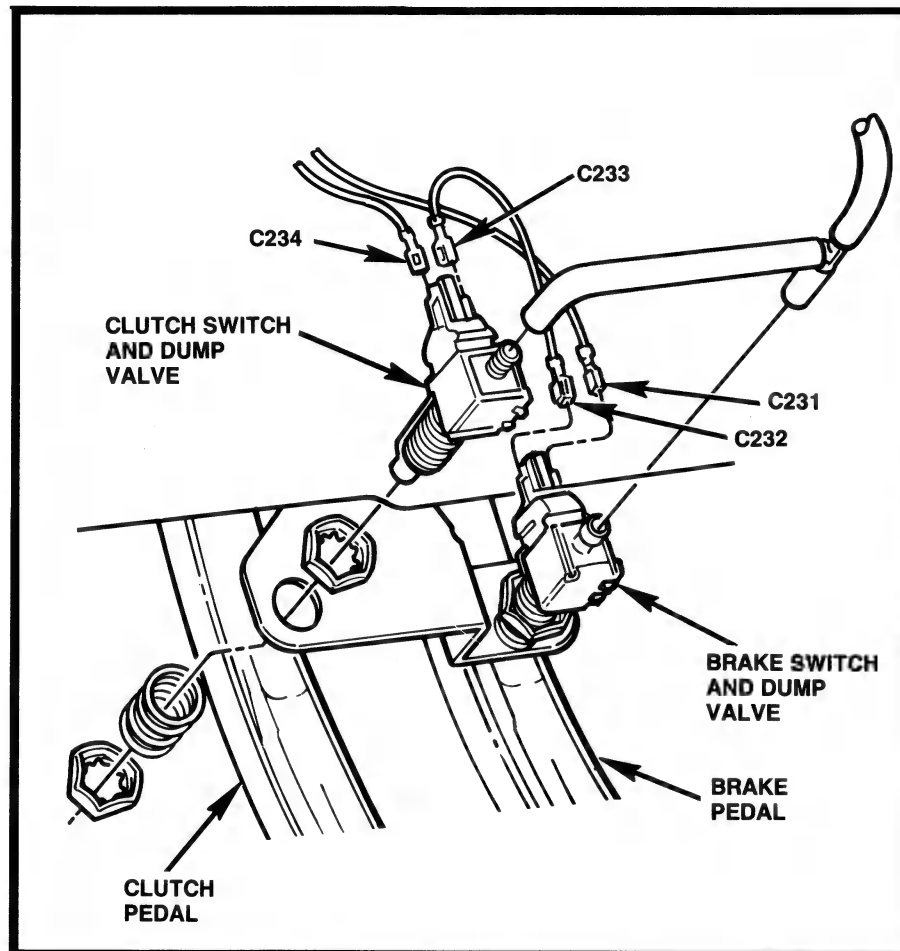


Figure 1 — Speed Control Brake and Clutch Switch

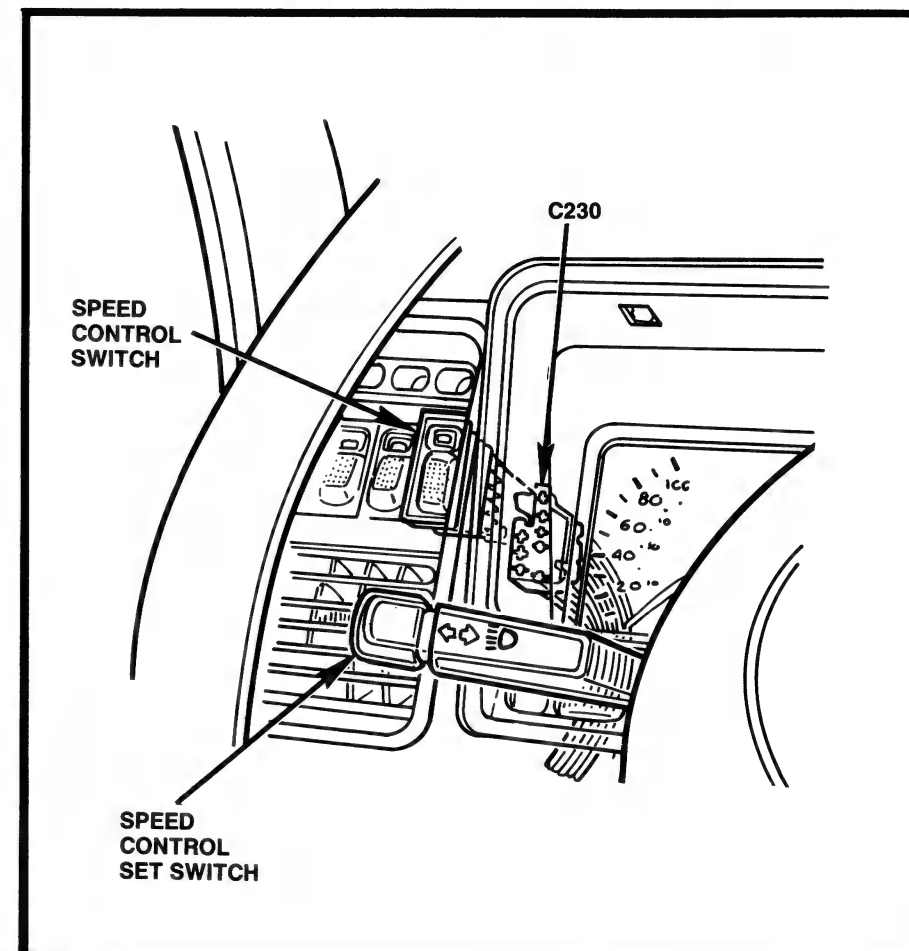
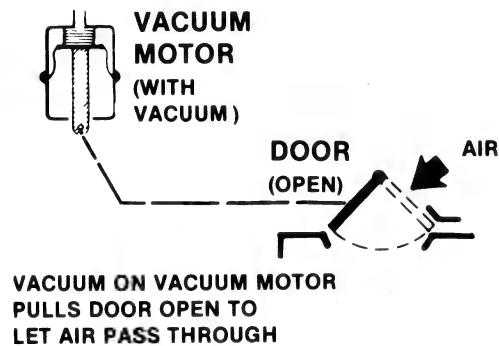


Figure 2 — Speed Control Switches

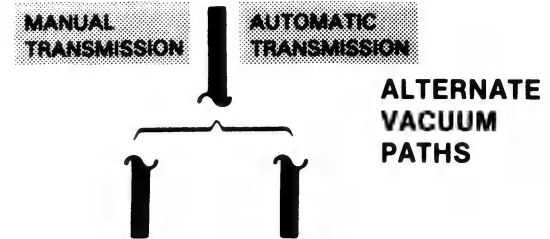
100 VACUUM SYMBOLS



FROM VACUUM DISTRIBUTION



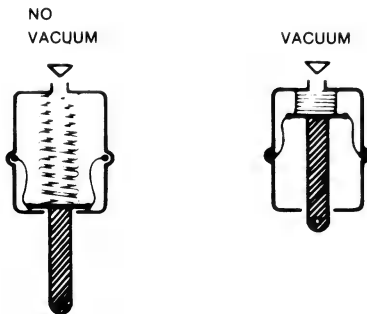
"CUT" HOSES REFERENCED BETWEEN PAGES
ARROW SHOWS VACUUM FLOW FROM MANIFOLD FITTING TO COMPONENT



NOTE
Other vacuum symbols used on vacuum system diagrams are fully explained on those pages.

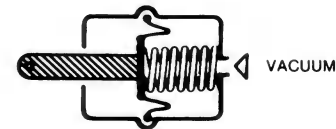
VACUUM MOTOR OPERATIONS

SINGLE DIAPHRAGM MOTOR



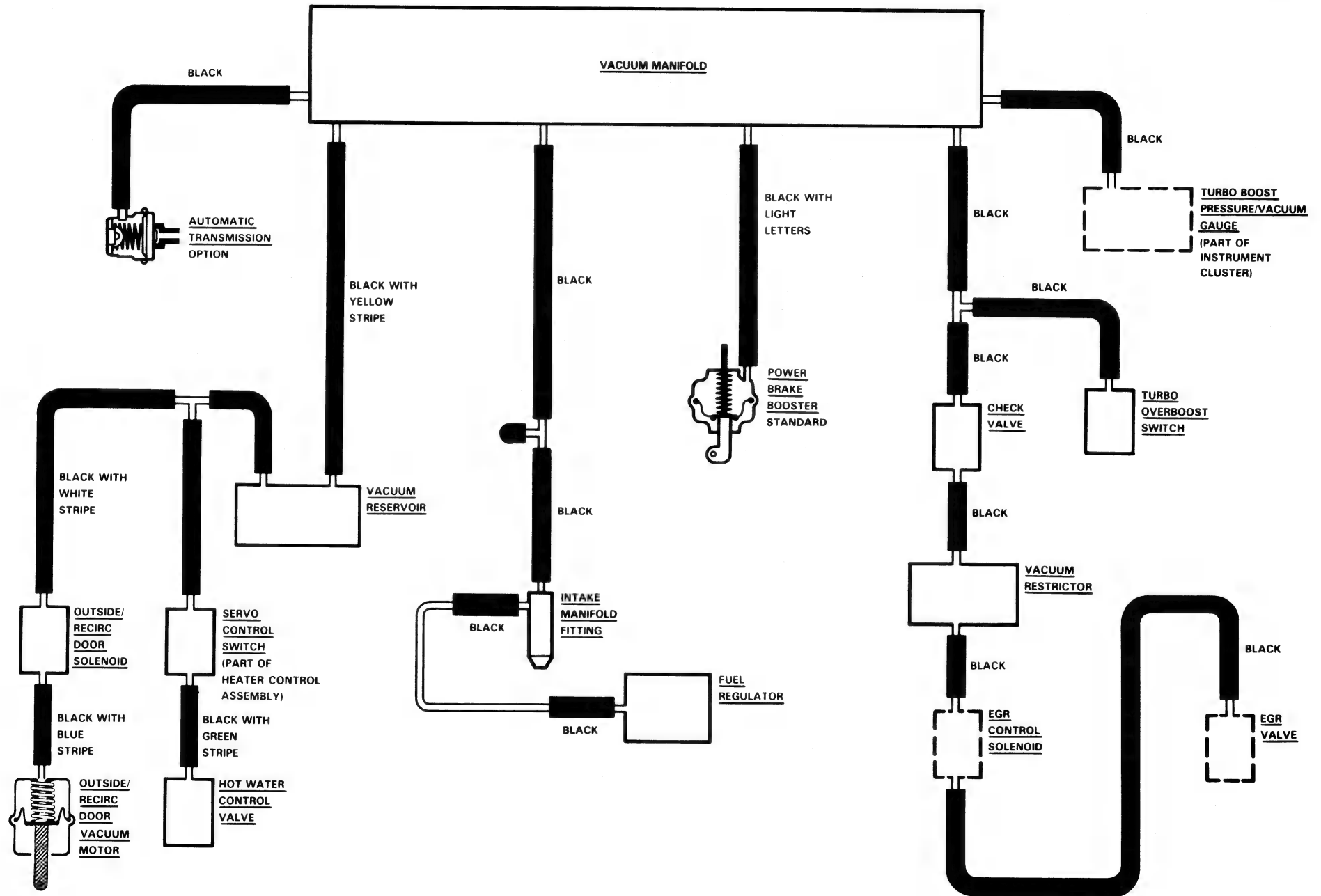
Vacuum motors operate like electrical solenoids, mechanically pushing or pulling a shaft between two fixed positions. When vacuum is applied, the shaft is pulled in. When no vacuum is applied, the shaft is pushed all the way out by a spring.

SERVO MOTOR



Some vacuum motors such as the **Servo Motor** in the **Speed Control** can position the actuating arm at any position between fully extended and fully retracted. The **Servo** is operated by a control valve that applies varying amounts of vacuum to the motor. The

higher the vacuum level, the greater retraction of the motor arm. **Servo** motors work exactly the same as the two-position motors: the only difference is in the way the vacuum is applied. **Servo Motors** are generally larger and provide a calibrated control.



TROUBLESHOOTING HINTS

These six steps present an orderly method of troubleshooting:

Step 1. Verify the problem.

- Operate the complete system and see all symptoms for yourself in order to:
 - check the accuracy and completeness of the customer's complaint.
 - learn more that might give a clue to the nature and location of the problem.

Step 2. Narrow the problem.

- Using this manual, narrow down the possible causes and locations of the problem in order to more quickly find the exact cause.

Step 3. Test the cause.

- Use test procedures to find the specific cause of the symptoms.

Step 4. Verify the cause.

- Confirm the fact that you have found the correct cause through operating the parts of the circuit you think are good.

Step 5. Make the repair.

- Repair or replace the faulty component.

Step 6. Verify the repair.

- Operate the system as in Step 1 and check that your repair has removed all symptoms, and also has not caused any new symptoms.

TROUBLESHOOTING TESTS

NOTE

Vacuum system problems fall into three groups:

1. **Leaks** in hoses, connectors, or motor diaphragms.
2. **Pinched Lines or Clogged Valves.**
3. **Faulty mechanical operation of parts driven by vacuum motors.**

Vacuum Supply Test

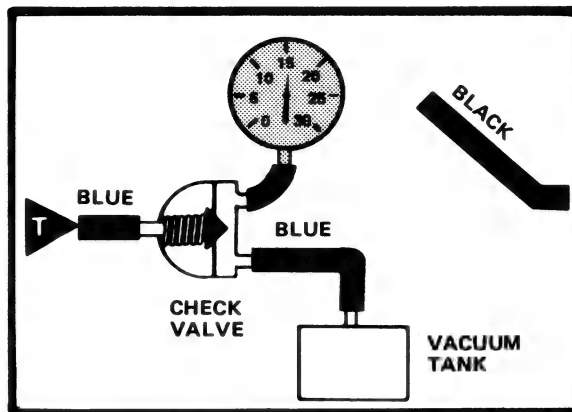


Figure 1 — System Supply Test

1. Connect **Vacuum Tester** to system side of **Check Valve** (Figure 1).
2. Start engine. Gage should show approximately 15" of vacuum.
3. Turn off engine. Watch gage.
 - If vacuum holds, supply OK.
 - If vacuum fails, replace **Check Valve** or **Tank**.

Leak Test

1. Connect **Vacuum Gage** and **Vacuum Pump** (Figure 3) to system hose in place of tank.
2. Open valve and start pump. Operate controls in all modes.
3. Listen for hiss, watch gage.

NOTE

Hissing is normal at Function Control when changing modes.

If system hisses or loses vacuum, find system leak as follows:

1. Turn on **Vacuum Pump** and check for vacuum build-up.

2. Stop pump, vacuum should drop.
3. Clamp supply hoses with needle-nose pliers one at a time until vacuum stops dropping (Figure 3).
4. Check vacuum schematic to find components in that line.
5. Clamp hoses through circuit to find leak.

Component Test

1. Connect **Vacuum Tester** (Figure 2) to component.
2. Pump **Vacuum Tester** and check that component operates correctly and vacuum holds.
3. Replace component if vacuum doesn't hold.

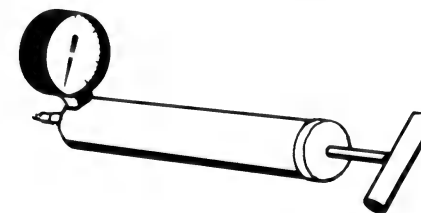


Figure 2 — Vacuum Tester

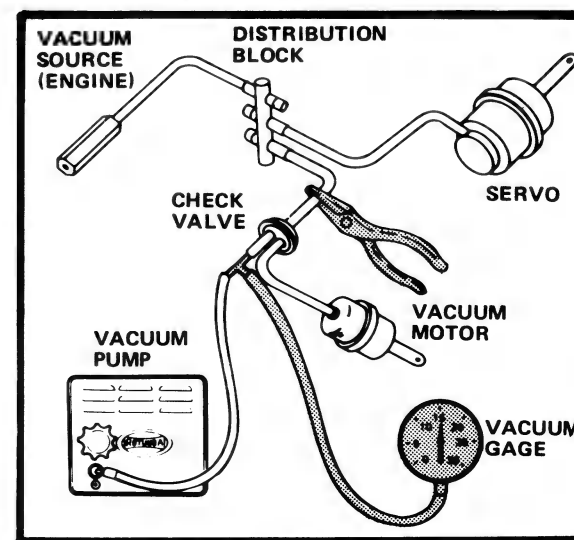


Figure 3 — Testing For Leak In Typical Vacuum System

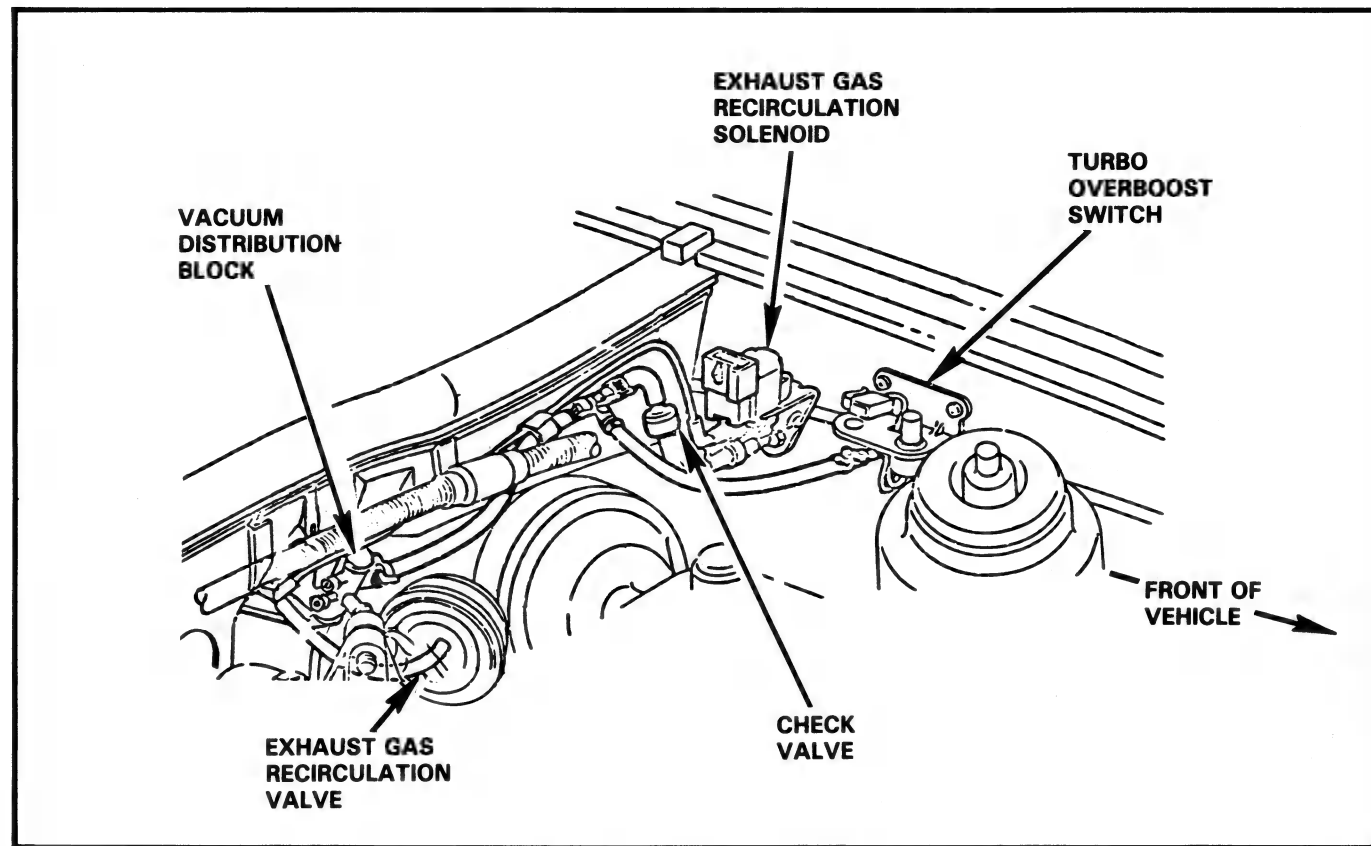


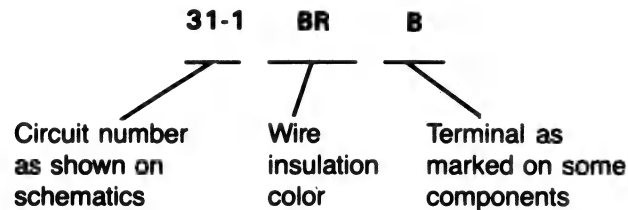
Figure 1 – EGR Vacuum Distribution

INTRODUCTION

Component testing procedures are provided to prove that a component is good or bad.

Testing information for each component includes a schematic component terminal locations and step-by-step test procedures. Component terminals are identified:

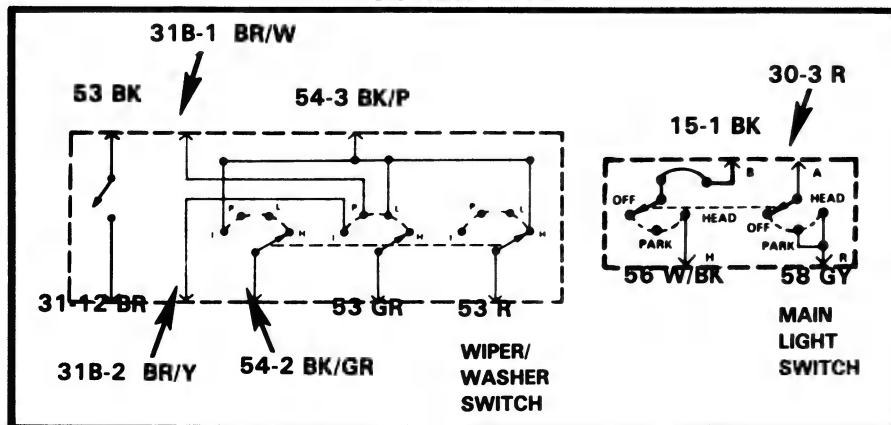
1. by the circuit number of the wires that connect to that terminal;
2. by the wire insulation color;
3. by letters or numbers which may be marked on the component.



The component connector **MUST BE REMOVED** before testing. To test a single circuit within the component, select that circuit under the column **TO TEST**. If you wish to test the complete component, perform all tests.

Connect the tester to the terminals shown in the second column and operate the component as shown in the third column.

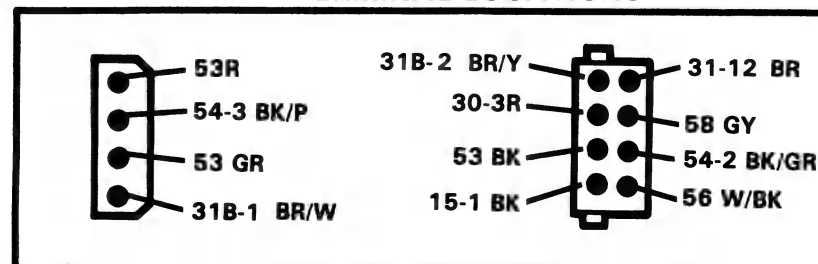
SCHEMATIC



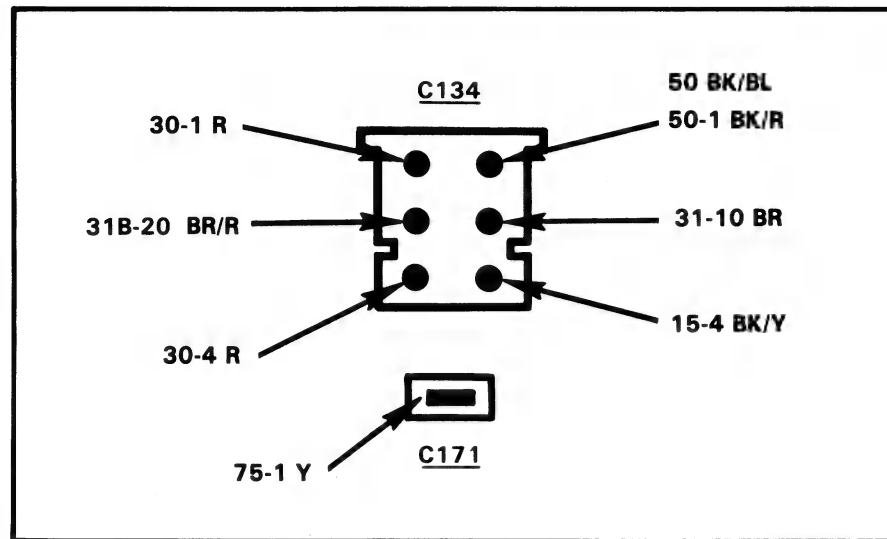
COMPONENT TESTING PROCEDURE

TO TEST	Connect Self Powered Test Light or Ohmmeter to Terminals	Move Switch to These Positions	A Good Switch Will Indicate
Headlight Circuit	56 W/BK and 15-1 BK	Off Open Circuit Park Open Circuit Head Closed Circuit	
Park Light Circuit	58 GY and 30-3 R	Off Open Circuit Park Closed Circuit Head Closed Circuit	
Wiper Switch Circuit	54-3 BK/P and 53 GR	Off Open Circuit Lo Closed Circuit Hi Open Circuit Int Open Circuit	
	54-3 BK/P and 53 R	Off Open Circuit Lo Open Circuit Hi Closed Circuit Int Open Circuit	
	54-3 BK/P and 54-2 BK/GR	Off Open Circuit Lo Open Circuit Hi Open Circuit Int Closed Circuit	
Interval Wiper Circuit	31B-2 BR/Y and 53 GR	Off Open Circuit Lo Open Circuit Hi Open Circuit Int Closed Circuit	
	54-3 BK/P and 54-2 BK/GR	Off Open Circuit Lo Open Circuit Hi Open Circuit Int Closed Circuit	
Wash Circuit	53 BK and 31-12 BR	Off Open Circuit On Closed Circuit	

TERMINAL LOCATIONS



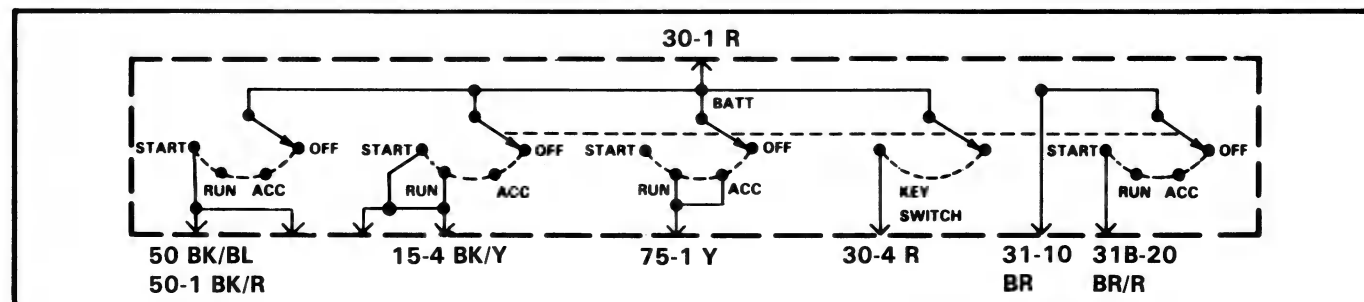
TERMINAL LOCATIONS



COMPONENT TESTING PROCEDURE

TO TEST	Connect Self Powered Test Light or Ohmmeter to Terminals	Move Key to These Positions	A Good Switch Will Indicate
"Acc" Circuit	30-1 R and 75-1 Y	Off, Acc, Run, Start	Closed Circuit in Acc and Run positions
Starter Relay Switch Circuit	30-1 R and 50 BK/BL, 50-1 BK/R	Off, Acc, Run, Start	Closed Circuit in Start position only
Ignition Switch Circuit	30-1 R and 15-4 BK/Y	Off, Acc, Run, Start	Closed Circuit in Run and Start positions.
Dual Warning Buzzer	30-1 R and 30-4 R	Off, Acc, Run, Start	Closed Circuit in Start position only
Circuit Bulb Test Circuit	31-10 BR and 31B-20 BR/R	Off, Acc, Run, Start	Closed Circuit in Start position only

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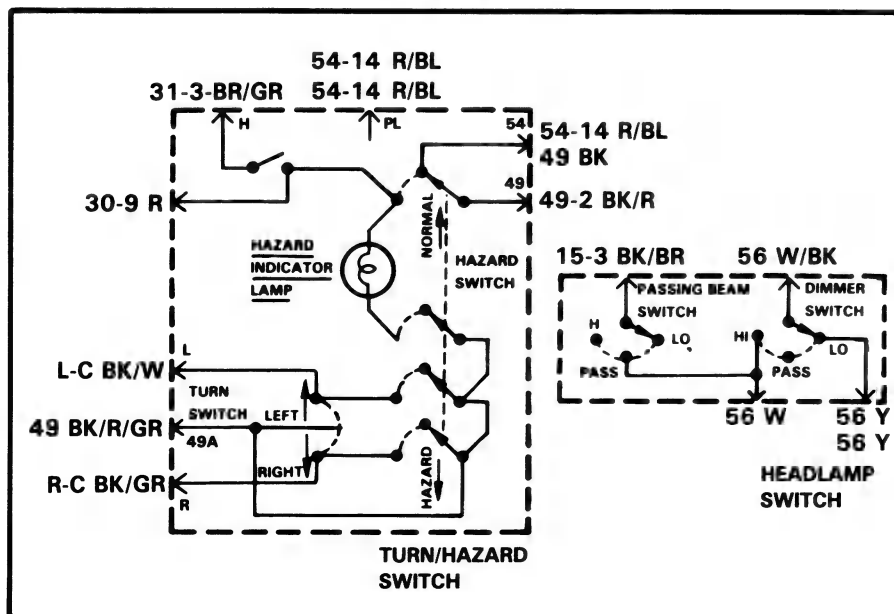


106 COMPONENT TESTING: MULTI-FUNCTION SWITCH

COMPONENT TESTING PROCEDURE

TO TEST	Connect Self Powered Test Light or Ohmmeter to Terminals	Move Switch to These Positions	A Good Switch Will Indicate
Turn Switch Circuit	49 BK/R/GR and L-C BK/W	Turn Switch to Turn Left	Closed Circuit
	49 BK/R/GR and R-C BK/GR	Turn Switch to Turn Right	Closed Circuit
	49 BK and 49-2 BK/R	Hazard Switch to Normal	Closed Circuit

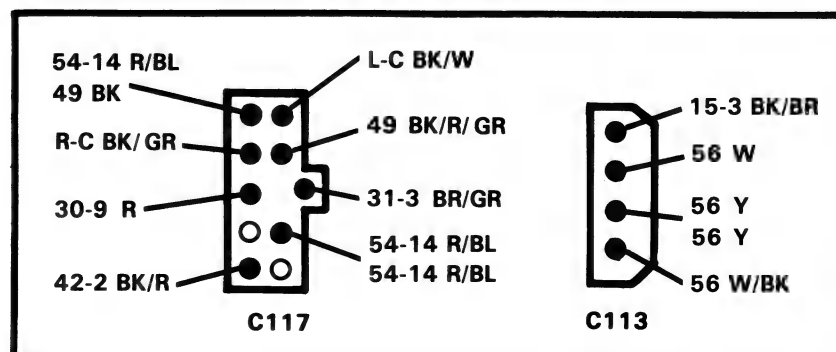
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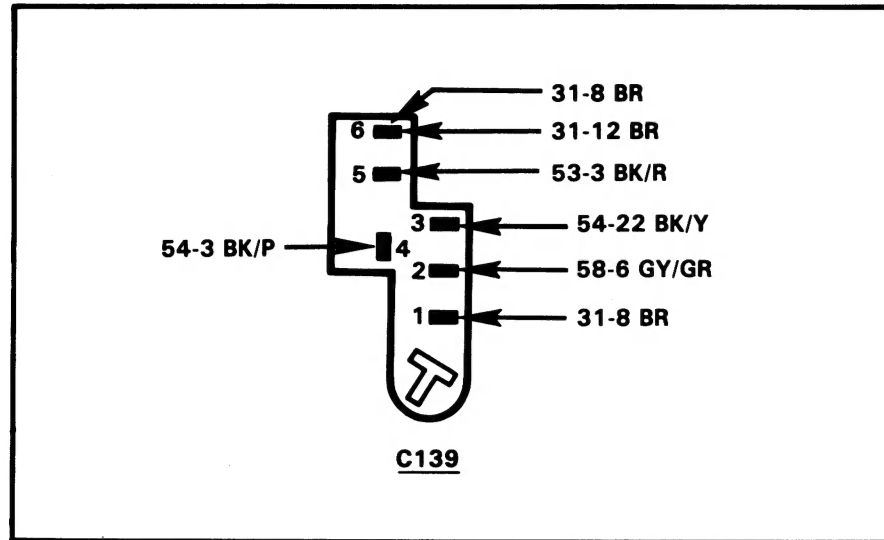
COMPONENT TESTING PROCEDURE

TO TEST	Connect Self Powered Test Light or Ohmmeter to Terminals	Move Switch to These Positions	A Good Switch Will Indicate
Hazard Switch Circuit	30-9 R and 49-2 BK/R	Hazard	Closed Circuit
	30-9 R and L-C BK/W	Hazard	Closed Circuit
	30-9 R and R-C BK/GR	Hazard	Closed Circuit
Passing Beam and Dimmer Switch Circuit	15-3 BK/BR and 56W	Pull 1/2 way up	Closed Circuit
	56 W/BK and 56W	Pull up and Release	Closed Circuit only when switch is in Hi position
	56 W/BK and 56 Y	Pull up and Release	Closed Circuit only when switch is in Lo position

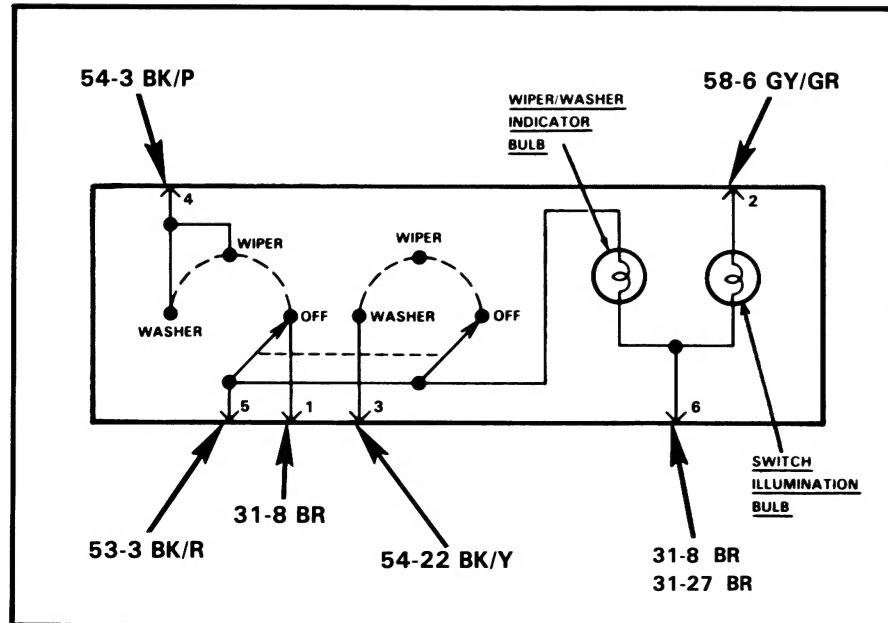
TERMINAL LOCATIONS



TERMINAL LOCATIONS



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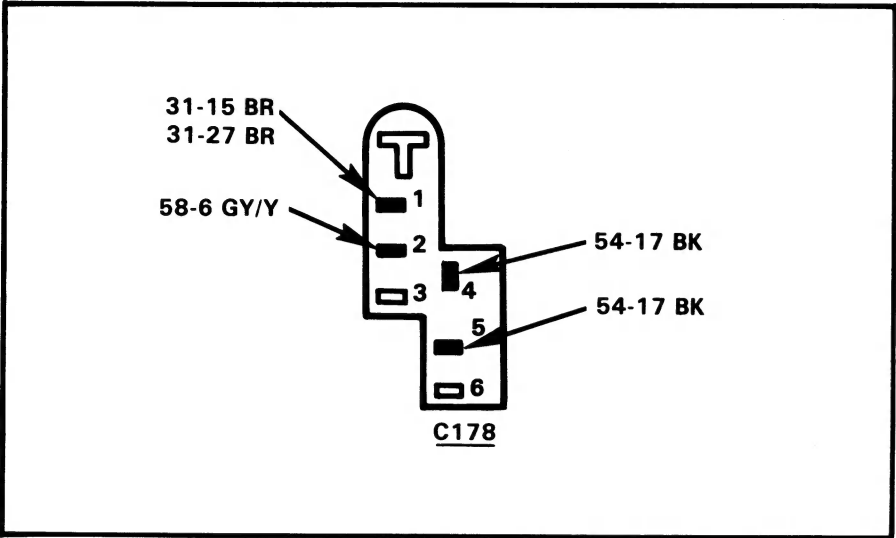


COMPONENT TESTING PROCEDURE

TO TEST	Connect Self Powered Test Light or Ohmmeter to Terminals	Move Knob to These Positions	A Good Switch Will Indicate
Wiper Circuit	54-3 BK/P and 53-3 BK/R	Off Open Circuit Wiper Closed Circuit Washer Closed Circuit	
Washer Circuit	54-3 BK/P and 54-22 BK/Y	Off Open Circuit Wiper Open Circuit Washer Closed Circuit	
Park Circuit	53-3 BK/R and 31-8 BR	Off Closed Circuit Wiper Open Circuit Washer Open Circuit	
Wiper/ Washer Indicator Bulb Circuit	53-3 BK/R and 31-12 BR	All Closed Circuit	
Switch Illumination Bulb Circuit	58-6 GY/GR and 31-12 BR	All Closed Circuit	

108 COMPONENT TESTING: LIFTGATE DEFROST/HEATED MIRROR SWITCH

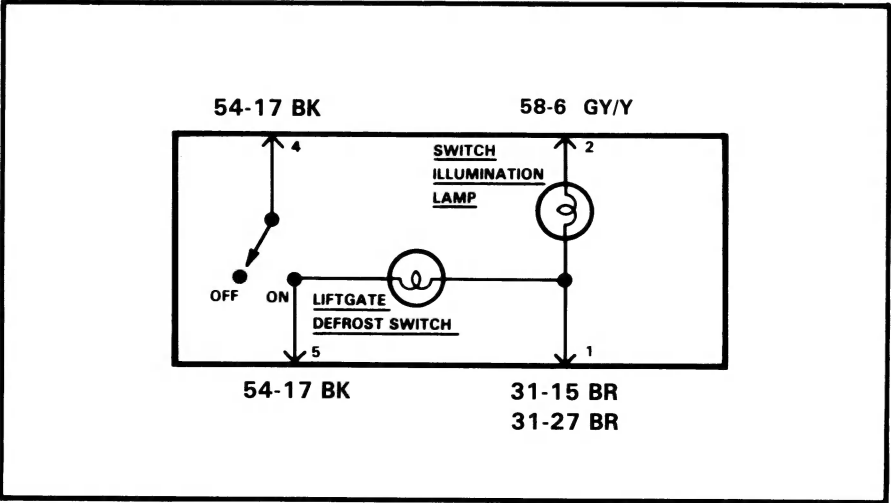
TERMINAL LOCATIONS



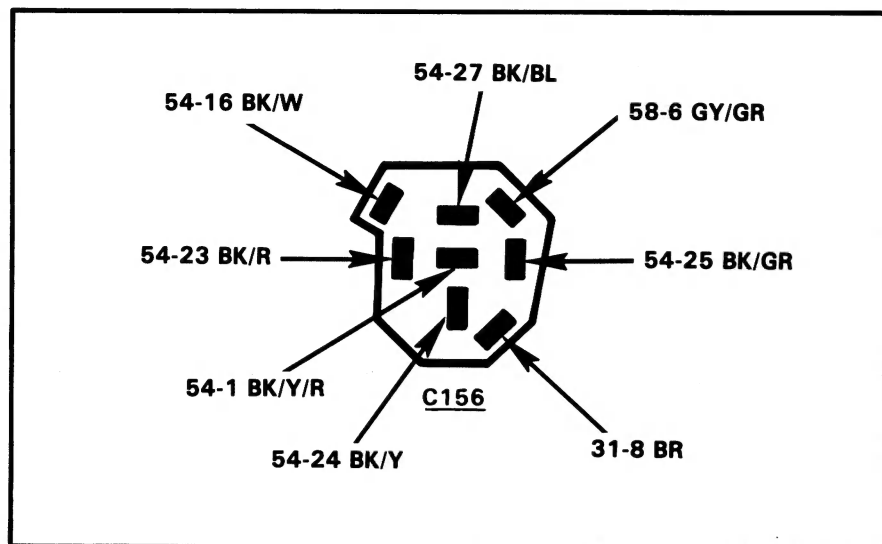
COMPONENT TESTING PROCEDURE

TO TEST	Connect Self Powered Test Light or Ohmmeter to Terminals	Move Switch to These Positions	A Good Switch Will Indicate
ON, Off Switch Circuit	54-17 BK (Pin 4) <i>and</i> 54-17 BK (Pin 5)	On..... Closed Circuit Off..... Open Circuit	
Defrost Indicator Lamp Circuit	31-15 BR <i>and</i> 54-17 BK (Pin 4)	On..... Closed Circuit Off..... Open Circuit	
Switch Illumination Lamp Circuit	58-6 GY/Y <i>and</i> 31-15 BR	Any..... Closed Circuit	

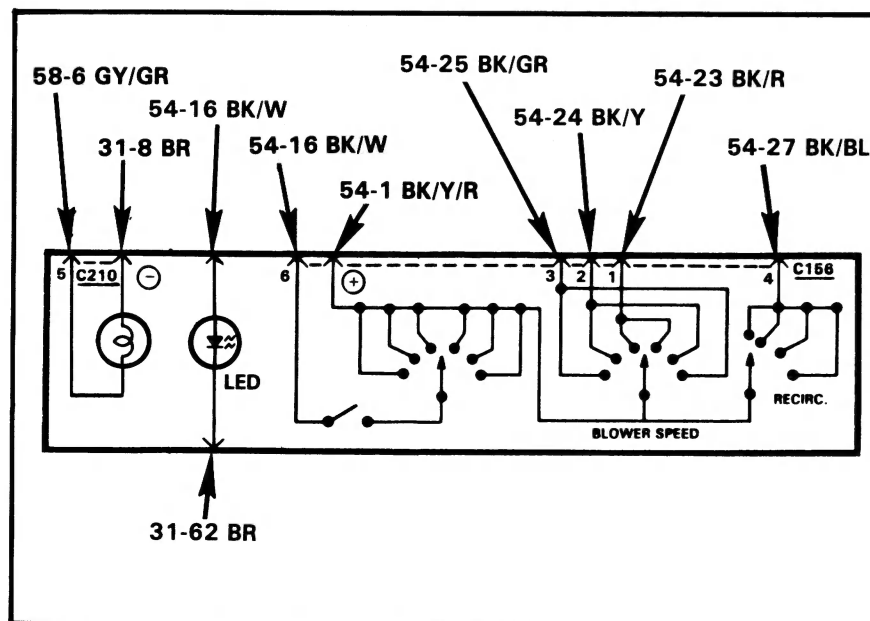
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TERMINAL LOCATION



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COMPONENT TESTING PROCEDURE

TO TEST	Connect Self Powered Test Light or Ohmmeter to Terminals	Move Control to These Positions	A Good Switch Will Indicate
Blower Low Speed Switch Circuit	54-1 BK/Y/R and 54-23 BK/R	Off Open Circuit Low (CW CCW) Closed Circuit Medium (CW CCW) Open Circuit High (CW CCW) Open Circuit	
Blower Medium Speed Switch Circuit	54-1 BK/Y/R and 54-24 BK/Y	Off Open Circuit Low (CW CCW) Open Circuit Medium (CW CCW) Closed Circuit High (CW CCW) Open Circuit	
Blower High Speed Switch Circuit	54-1 BK/Y/R and 54-25 BK/GR	Off Open Circuit Low (CW CCW) Open Circuit Medium (CW CCW) Open Circuit High (CW CCW) Closed Circuit	
A/C Push Button Switch Circuit	54-1 BK/Y/R and 54-16 BK/W	On Closed Circuit Off Open Circuit	
Recirc. Switch Circuit	54-1 BK/Y/R and 54-27 BK/BL	Off Open Circuit Low (CCW) Closed Circuit Medium (CCW) Closed Circuit High (CCW) Closed Circuit Low (CW) Open Circuit Medium (CW) Open Circuit High (CW) Open Circuit	
A/C Indicator Lamp Led Circuit	54-16 BK/W and 31-62 BR	Any Closed Circuit	
Illumination Lamp Circuit	58-6 GY/GR and 31-8 BR	Any Closed Circuit	

110 COMPONENT TESTING: POWER WINDOW SWITCH

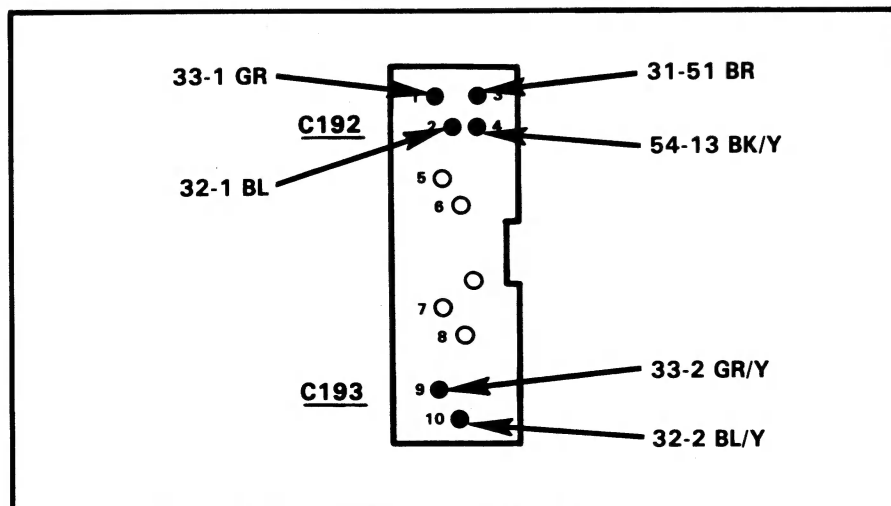
COMPONENT TESTING PROCEDURE

TO TEST	Connect Self Powered Test Light or Ohmmeter to Terminals	Move Switch to These Positions	A Good Switch Will Indicate
Up Power Circuit	LH 54-13 BK/Y and 32-1 BL	Down Open Circuit Up Closed Circuit	
	RH 54-13 BK/Y and 32-2 BL/Y	Down Open Circuit Up Closed Circuit	
Down Panel Circuit	LH 54-13 BK/Y and 33-1 GR	Down Closed Circuit Up Open Circuit	
	RH 54-13 BK/Y and 33-2 GR/Y	Down Closed Circuit Up Open Circuit	

COMPONENT TESTING PROCEDURE

TO TEST	Connect Self Powered Test Light or Ohmmeter to Terminals	Move Switch to These Positions	A Good Switch Will Indicate
Up Ground Circuit	LH 31-51 BR and 32-1 BL	Down Closed Circuit Up Open Circuit	
	RH 31-51 BR and 32-2 BL/Y	Down Closed Circuit Up Open Circuit	
Down Ground Circuit	LH 31-51 BR and 33-1 GR	Down Open Circuit Up Closed Circuit	
	RH 31-51 BR and 33-2 GR/Y	Down Open Circuit Up Closed Circuit	

TERMINAL LOCATIONS



SCHEMATIC

